A PADDY-FIELD IN JAVA WITH VEGETABLE CROPS.
SWEET-POTATOES IN THE FOREGROUND, LIMA BEANS BEHIND.

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The Transplanting of Rice, and Rotation of Crops in the Paddy Field.

Nothing, to one who has studied rice cultivation in the different countries of the Tropics, is more noteworthy than the obstinate way in which the natives of each country cling to their own particular methods of cultivation and refuse even to try those of other places—assuming, without trial, that being those of foreigners or barbarians they must of necessity be worse.

In this number we give two interesting photographs from Java. The first is of a newly-planted paddy field, in which the long straight lines of the crop transplanted from the nurseries can be seen. This is real transplanting. It is often said that transplanting is the custom near Kandy, but so far we have never seen anything done but a transplanting of the plants from thicker to thinner areas, the sowing having been broadcast. In Java the plants are put in from nurseries at even distances apart, in straight lines. Several letters in this Journal in the last two months attest the great gain by the use of this method. One great objection raised to this custom here is its greater expense, while the gain from it is overlooked. With the proper use of co-operative credit the extra expense should not matter.

The other photograph is of a paddy field a few weeks after the crop has been removed. It looks more like a vegetable garden, with sweet potatoes in the foreground and Lima beans behind. The moment the crop is cut instead of allowing the fields to lie idle for a trifle of grazing, as is done here, the water is run in to soften them and they are ploughed and planted with vegetables. The only place, so far as we know, where anything of the kind is done in Ceylon, is in the Matara district, where sweet potatos are grown in the paddy fields.

GUMS, RESINS, SAPS AND EXUDATIONS.

THE GUAYULE RUBBER OF MEXICO.

The form of Mexican rubber known as "Guayule" has been known for a considerable time, but it is only recently that full particulars regarding the plant from which it is derived have been available, and that attempts have been made to exploit the material on a commercial scale. The plant appears unlikely to be of much importance as a source of rubber outside of Mexico, but as it possesses several features of interest, a short account may be given of its characters and of the methods employed for obtaining the rubber. The subject has been attracting considerable attention both in America and Europe, and several notices of the plant and of the projects put forward for its exploitation have been published recently in the technical papers, the most important of these being an article by Dr. R. Endlich of Mexico which appeared in *Der Tropenpflanzer*, vol. IX., 1905, p. 233.

The Guayule plant is *Parthenium argentatum*, A. Gray, belonging to the natural order *Compositae*. It is a small plant, varying from 8 to 40 inches in height, with an average of about 24 inches, and has a much branched stem which bears small silver-gray leaves and yellow flowerheads. In Mexico it flowers during September and October.

The plant occurs over a large portion of the "bush prairies" in Northern Mexico, the most important districts being Chihuahua, the northern parts of the states of Zacatecas and San Luis Potosi, the eastern part of Durango, and especially the southern districts of Coahuila. It also extends northward into the United States and is met with in Texas, New Mexico and Arizona. Its occurrence has been reported from Southern Mexico, and also from Central America and Venezuela, but these statements have not been confirmed and appear to be devoid of foundation. The area in Northern Mexico, which includes the chief sources of supply, is stated to be about 29,000 square miles.

The Guayule plant is not so abundant or so widely distributed as was at first supposed, owing to the fact that it was confused with another composite of the same genus, *Parthenium incanum*, which occurs freely in the same regions. The Guayule is found at altitudes ranging from 3,000 to 5,600 feet, and grows equally well upon the plateaux or upon the hill-sides, being specially abundant on the lower slopes of the larger mountains. The soil in these regions is usually very dry, often rocky and contains a large percentage of lime. In most cases the plants occur scattered amongst the other vegetation, but small areas are occasionally found where the Guayule grows almost exclusively. It is thought from observations upon the wild plants that under favourable conditions it will be possible to reproduce them freely from seed, but experiments will be necessary before this point can be decided. Some authorities believe that plants raised from seed attain the average size of the wild plants in from 8 to 10 years, whereas others fix the time at from 12 to 15 years. Younger plants will furnish rubber, however, in proportion to their bulk. The general opinion in Mexico is that Guayule plants gradually die off after reaching the age of 15 years, but when the stems are cut down it is stated that new shoots soon appear and furnish a new plant in due course. The average weight of the plants as collected for the extraction of the rubber is not more than about 1 lb., the minimum about $\frac{1}{4}$ lb. and the maximum about $6\frac{1}{2}$ lb.

Parthenium argentatum is the only plant belonging to the natural order *Compositae* which is at present known to furnish rubber, and it is said to differ from most rubber-yielding plants in the fact that it does not contain a well-developed

A NEWLY-TRANSPLANTED PADDY-FIELD IN JAVA.

laticiferous system. The latex is apparently contained in isolated cells which ar present in both wood and bark, though principally in the latter. The bark, in fact, furnishes a little more than three-fourths of the total amount of rubber, but it also contains the resinous substances which give rise to the stickiness hitherto characteristic of Guayule rubber. Apparently little or no rubber is present in the young leafy shoots. From the results of practical trials, it is stated that in 100 parts of the dried plants there are on an average 47 parts of wood, 44½ parts of bark, and 8½ parts of leaves and young shoots.

Experiments in connection with the extraction of Guayule rubber have been in progress for a number of years, but it is only within the last two years that the matter has attained commercial importance. Only one factory was actually at work in Mexico last year, but several others were in course of erection, and will commence operations at an early date. A number of different processes have been introduced for the extraction of Guayule rubber, some of which have been kept secret, whilst others have been protected by patents. The methods may be divided into two chief classes : (1) those in which the rubber is extracted by solvents, and (2) those in which it is separated by mechanical means. In processes of the first kind the plants, after crushing, are treated with a suitable solvent, the greater part of which is afterwards recovered by distillation, and the residue is freed from resin by treatment with a hot alkaline solution, or with wood spirit. In the methods involving mechanical treatment, the plants are reduced to a coarse powder which is submitted to a rubbing or heating action, either in the presence or absence of water, until the particles of rubber cohere and can be separated from the vegetable matter. The rubber thus obtained can be treated as above for the removal of the resin, and is freed from the vegetable impurities by thorough washing with water. In other processes the crushed plants are heated with an alkaline solution in a similar manner to that used for the preparation of wood pulp, and the separated rubber is washed well with water.

The amount of crude rubber furnished by these processes varies from 8 to 12 per cent., according to the amount of moisture present in the plants treated, and the yield of the purified material may be taken as 7 to 10 per cent.

Guayule rubber as first prepared was usually in flakes, which had a greenish-grey colour when fresh, but blackened on the surface when kept. It was very soft and sticky, owing to the presence of a large amount of resin, and it frequently contained large proportions of water and vegetable impurities. The composition of two such specimens has been recorded by Markwald and Frank as follows :—

	I.	II.
	Per cent.	Per cent.
Ash	1·3	2·68
Mechanical impurities	9·7	—
Water	26·0	20·69
Resin	29·2	19·35
Caoutchouc	33·8	57·28

The caoutchouc present in these specimens was a little sticky, but exhibited considerable tenacity.

The introduction of improved methods for washing the crude rubber and for removing some of the resin has resulted in the production of a much more superior material. The crude rubber as at present obtained usually contains about 63 per cent. of caoutchouc and 22 per cent. of resin, the remaining 15 per cent. being

water and a small amount of vegetable matter. After purification, however, the amount of caoutchouc is much higher, and Markwald and Frank found 77 per cent. in a sample which they examined. Formerly the rubber was only worth 1s. 4d. per lb., whereas the improved product can be sold at 2s. 4d. per lb., or more. It is stated that a small quantity of rubber extracted from the dried plants in Germany by a laboratory process was valued in that country and in England at from 3s. 2d. to 3s. 8d. per lb.

It appears certain, therefore, that the Guayule plant will furnish rubber of very fair quality, but it remains to be seen whether the extraction of this rubber upon a commercial scale will prove successful. The plant can be cultivated in sterile regions unsuitable for other purposes, and as it can be collected all the year round, the industry will be continuous. On the other hand, there will be certain difficulties in working on a large scale, as the places at which factories can be established are limited owing to the necessity of having a liberal supply of water, and in some cases the plants may have to be transported some considerable distance before treatment, thereby increasing the cost of production. These points will be cleared up, however, by the experiments now in progress, which will demonstrate the possibility or otherwise of successfully utilising the Guayule plant as a source of rubber.—*Bulletin of the Imperial Institute.*

RESIN IN RUBBER.

The plantation rubber cured by the process described by me in a recent number of the *India Rubber World* (March 1, 1906, page 188) was found by the factory, which purchased it, to contain a large percentage of resinous matter, though not as much as rubber cured on a neighbouring plantation from trees of the same age by evaporation or absorption only.

Further study leads me to believe that planters have been misled by the demand of manufacturers for a perfectly dry rubber. To dry perfectly, one must make rubber into very thin sheets, pancakes, or crepe. Complaint is made of all these, whether they be of *Castilloa* or Para, and the reason would seem to be resin. Whence the resin? That is a question I wish manufacturers and planters would set themselves to answer at once. It will take the planter alone years to answer, because he is not a chemist. If the manufacturer will help, it will take weeks only.

I submit for consideration my view, based on a planter's observation. Resin or the most of it seems to be due to drying and exposure. *Castilloa*, the core of a ball of the finest Para, and the best Congo, cut thin and thrown into a drawer for a few months, became almost equally gummy and pasty, a state which I assume to indicate resin. *Castilloa*, if kept long enough, will run down from the shelf, here, like tar. The white core (that is to say, the part not completely dried) of a thick piece of plantation *Castilloa* answers all the visual and actual tests of the best Para, while the dry skin is short and tacky, the more the older. What takes place? Is it due to oxygen, light, or bacteria? Will some one make tests of the white hermetically sealed core and the black rim of a ball of Para, of white plantation *Castilloa*, and thin, sticky pancakes or sheets of the same of crepe, of rubber milk, etc.? If the resin does not come out of the tree, the planter will know what to do and the manufacturer will doubtless reform his method of drying by exposing for weeks or months thin sheets of mangled rubber.

—*I. R. World.* GORDON WALDRON.
Nicaragua.

RESEARCHES ON THE COAGULATION OF THE LATEX.

With the view of defining the conditions under which coagulation takes place and the influence of certain factors on the properties of pure rubber, as well as to study the reaction of vulcanization, V. Henri has carried out a series of experiments with latex from the *Hevea brasiliensis*, which are fully described in "Le Caoutchouc et la Gutta Percha." The latex was slightly alkaline, had a specific gravity of 0·973, contained 8·7 grams of solids per 100 c.c., and its specific electric conductability at 25 deg. was 0·0033, equivalent to that of a solution of sodium chloride of a strength of 0·25 grams per 100 c.c. As will be seen later the concentration and nature of the salts in a latex influence its coagulation.

The microscopic examination of the latex revealed the presence of a large number of globules, some with a diameter of nearly 0·002 millimetres, others smaller, the latter exhibiting extremely intense and persistent Brownian movements. It is interesting to note that the number of globules in a latex, ascertained in the same manner as the enumeration of corpuscles in blood, indicates the richness of the latex. The operation is simple. The most suitable diluent in this case was found to be a 20 per cent solution of sodium chloride, which arrest the Brownian movements, without precipitating or coagulating the latex. An average of fifty million globules per cubic millimetre was obtained.

Regarding the coagulation of the latex there exists a series of bodies which readily cause coagulation in some, but have no effect on others. The reason of this has not yet been discovered. The coagulation of the latex has been compared with the coagulation of albuminoids, it even being surmised that these bodies are essential to the process. Another view is held by the author, namely, that the latex is a suspension of very fine particles in aqueous liquid more or less rich in saline or organic bodies. When, then, coagulation occurs the rubber globules unite. Further, recent researches have shown that the same general law governs both the precipitation of colloidal solutions and the agglomeration of fine suspensions. A comparison between the two is therefore possible, so that the same methods of investigation are equally applicable to both.

Now electrolytes cause the precipitation of colloids, therefore in studying this precipitation it is essential to work with solutions as pure as possible. It is the same with the coagulation of the latex of rubber; other bodies dissolved therein must first be removed. Accordingly, the latex was dialyzed, when after fifteen days it was found to contain no appreciable quantity of salts, since its electric conductability was very similar to that of distilled water and the depression of its freezing point, which previously mounted to 0·22 deg., was less than 0·01 deg.

On adding different reagents to the latex one of three things may occur:—

1. There is no reaction.

2. Isolated flakes varying in size are formed which either rise or sink, but do not unite, being readily separated by stirring. This may be termed the agglutination of the latex.

3. A network of long threads encircling all the globules of the latex is observed. On stirring, the threads reunite, forming a solid elastic coagulum. This is the true coagulation of the latex.

The effect of a large number of reagents on the dialysed latex was studied, both individually and mixed, with the following results.

Methyl, ethyl, and amyl alcohols produced no reaction. Hitherto alcohol has been considered a coagulant, but its action evidently is due to salts present in the latex. Sodium potassium and ammonium salts also have no effect. Salts of calcium, barium and magnesium in sufficient quantities cause agglutination. Salts of

the heavy metals also produce agglutination, but with weaker solutions than is necessary with the salts of the alkaline earth. Hydrochloric, nitric and acetic acids all cause agglutination; very dilute sulphuric acid also has the same effect, but if more concentrated coagulation commences. Trichloracetic acid, even when very dilute, produces a remarkably elastic coagulum. Acetone also is a coagulant.

Regarding the action of mixtures, as a rule alcohol added after a salt produces agglutination or coagulation. With solutions of the salts of monovalent metals only agglutination occurs, and then the solutions must be very strong. Salts of bivalent metals on the other hand, even in very weak solutions, induce good coagulation. By gradually reducing the quantity of alcohol, coagulation gives place to agglutination, and with still less alcohol there is no reaction. It is therefore evident that the former is an intensification of the latter, since both are caused by the same agent; it is only a matter of concentration. Acids in conjunction with alcohol act like the salts of bivalent metals, but alkalies give no result. On studying the influence of alkalies on the coagulation of the latex it was found that an extremely small quantity interfered with the reaction; a ten-thousandth normal solution was sufficient to prevent agglutination or transform coagulation into agglutination. Thus magnesium chloride and alcohol produce coagulation, but if the latex is rendered even very slightly alkaline, only isolated flakes are formed, again showing that the passage from agglutination to coagulation is gradual, and that one may be considered as a higher stage of the other.

Conclusions of practical importance to be drawn from these investigations are that having now discovered that our knowledge of colloids is applicable to the coagulation of the latex of caoutchouc, we have every right to regard the latex in the same light as an emulsion.

Emulsions or colloidal solutions are charged electrically, either positively or negatively. It is essential to know which, since their precipitation is regulated thereby. The dialysed latex of rubber was found to be negatively charged. Accordingly, as negative emulsions are precipitated by acids and by salts of bi- and trivalent metals, and positively charged emulsions by alkalies and by salts of bi- and tribasic acids, it is readily understood why salts of monometals act differently to those, bivalent metals, and why acids react and alkalies do not, since the caoutchouc latex only confirms the general law, further establishing the connection between the properties of colloidal solutions and those of the rubber latex.—*India Rubber Journal.*

IMPORTS OF GUTTA PERCHA.

The imports of gutta percha, which had been steadily declining since 1900, till in 1904, when the amount was only one-fifth of what it was in the former year, again showed a rise, nearly double the amount of crude gutta coming into this country, but of this about one-fifth was re-exported.

Gutta percha is largely produced in British Possessions 5-9ths of our imports coming therefrom, while Venezuela contributes 3-9ths, the remainder coming from the Continent, whence it is imported in a partly-worked condition, and is entered as raw material.—*I. R. Journal.*

INDIA RUBBER MARKET.

LONDON, February 15th.—At to-day's auction, 464 packages of Ceylon and Malaya plantation grown rubber were under offer, of which about 443 were sold. The total weight amounted to 25⅓ tons, Ceylon contributing nearly 3⅓, and Malaya about 22 tons. There was good competition at about last sale rates for all kinds. Several attractive parcels were included in the offerings, the most noticeable being two invoices from Lanadron Estate, Muar; of these about 4 tons were composed of very fine block rubber and realised the highest price of the sale, viz., 5s. 11d. per lb., except two cases which brought 5s. 10¾d. Fine pale crepe was again in request from 5s. 9d. to 5s. 9¼d., one very fine parcel fetching 5s. 9¾d. Medium grades of crepe were slightly irregular, while dark sold well up to about 5s. 4d. per lb. Some very fine biscuits and sheet fetched 5s. 8½d., the general price being 5s. 8d. per lb. Plantation fine to-day.—5s. 7½d. to 5s. 11d., same period last year, 6s. 1¼d. to 6s. 2d. Plantation scrap.—4s. 4d. to 4s. 7d., same period last year, 3s. 8d. to 5s. 4d. Fine hard Para (South American).—5s. 1d., same period last year, 5s. 4¾d. Average price of Ceylon and Malaya plantation rubber.—443 packages at 5s. 6½d. per lb., against 238 packages at 5s. 11¼d. per lb. same period last year. Particulars and prices as follows :—

CEYLON.

MARK.	QUANTITY, DESCRIPTION AND PRICE PER LB.	
Siragalla	1 case	fine pale biscuits, 5s 8d.
Udapola	1 do	good biscuits, 5s 8d; 2 cases somewhat similar, 5s 8d; 1 case good palish to darkish biscuits, 5s 8d; 1 case fine pale scrap, 4s 6¾d.
We'Oya	2 do	fine pale darkish biscuits, 5s 8¼d.
Culloden	5 do	fine amber biscuits, 5s 8½d; 9 cases very fine pale crepe 5s 9¼d; 6 cases fine darkish crepe, 5s 4¼d; 1 case good darkish ditto, 5s 3¼d; 2 cases good dark, 5s 2¾d.
Ellakande	3 do	good yellow biscuits, 5s 8½d.
Nikakotua	3 do	fine amber sheet, 5s 8½d.
J.J.V. & Co.	1 do	dark scrap, 4s 5d; 1 case good scrap, 4s 7d; 1 case good dark scrap, 4s 7d; 1 case good rejections, 4s 11¼d.
Wiharagama	2 do	dull biscuits. 5s 8d.
Ambatenne	1 do	fine biscuits, 5s 8¼d; 1 case darker, 5s 8d; 1 case fine scrap, 4s 6½d; 1 case dark scrap, 4s 5¾d.
Good View	1 do	good biscuits, 5s 8d.
Waharaka	3 do	darkish scrap, 4s 4d; 1 case fine palish to darkish biscuits, 5s 8d.
Ballacadua	2 do	darkish crepe, 5s 2d; 2 cases fine palish to darkish biscuits, 5s 8½d.

MALAYA.

MARK.	QUANTITY, DESCRIPTION AND PRICE PER LB.	
B.R.R. Co. Ld.	14 do	fine washed sheet, 5s 7½d; 1 case fine dark blocks, 5s 8½d; 8 cases fine pale crepe, 5s 9d; 1 case fine small blocks, 5s 8¾d; 2 cases fine palish scrap crepe, 5s 4½d; 5 cases darkish, 5s 4d; 1 case good dark block, 5s 4d; 4 cases good dark crepe, 5s 1¾d; 4 cases brown crepe, 5s 2d; 1 case dark block, 5s 4d.
C.M.R.E. Ld.	12 do	fine pale crepe, 5s 9d; 3 cases good palish and darkish crepe, bought in; 9 cases good dark crepe, 5s 1¼d.
Jebong	7 do	fine amber sheet, 5s 8½d; 5 cases very fine pale crepe 5s 9¼d; 1 case fine palish, 5s 5¾d; 2 cases fine darkish, 5s 3d; 1 case good dark, 5s 1¾d.
S.S.B.R. Co., Ld. (in diamond)	5 do	fine amber sheet, 5s 8d; 1 case fine pale scrap, 4s 6¾d; 1 case darkish scrap, 4s 5d; 1 case pressed scrap (part uncured), 4s 5¼d.
S.P.S. (in circle)	1 do	good dark scrap, 4s 3½d; 3 bags rejections and scrap, 4s 5¾d.
P. S.	2 do	fine amber sheet, 5s 8¼d; 1 bag good ball scrap, 4s 5d.

V.R. Co. Ld. Klang F.M.S. (in triangle)	12 do	washed sheet, 5s 8d ; 8 cases fine pale crepe, 5s 9$\frac{1}{4}$d ; 2 cases fine palish, 5s 7d ; 13 cases dark smoked block, 5s 4$\frac{1}{4}$d.
K.P. Co. Ld.	18 do	fine palish sheet, 5s 8d ; 1 case rejected sheet, 5s 7$\frac{1}{4}$d ; 2 cases scrappy sheet, 4s 11$\frac{3}{4}$d ; 5 cases fine scrap, 4s 6$\frac{1}{2}$d to 4s 6$\frac{3}{4}$d ; 10 cases fine sheet, 5s 8d ; 1 case scrappy washed sheet, 4s 11$\frac{3}{4}$d ; 2 cases fine pale scrap, 4s 7d.
Yam Seng	10 do	fine amber sheet, 5s 8d ; 10 cases dark scrap, 4s 6$\frac{3}{4}$d ; 2 cases rejections, 4s 10$\frac{1}{4}$d.
R.R. (S. in diamond)	6 do	fine amber sheet, 5s 8d.
S.R. (S. in diamond)	1 do	fine scrap, 4s 7d.
GULA (in diamond)	2 do	fine amber sheet, 5s 8d ; 1 case scrappy rejections, 4s 7$\frac{1}{4}$d.
K. (in diamond)	4 do	fine amber sheet, 5s 8d ; 3 cases scrapy rejections, 4s 7$\frac{1}{4}$d.
Sungei Krudda	2 do	scrappy washed sheet, 5s 0$\frac{1}{2}$d ; 4 cases good scrap, 4s 6$\frac{1}{2}$d ; 7 cases fine amber sheet, 5s 8$\frac{1}{4}$d ; 1 case fine pressed undried, 5s 6$\frac{1}{2}$d ; 2 cases good lump scrap, 4s 5$\frac{3}{4}$d.
Linggi Plantns.	28 do	fine pale crepe, 5s 9$\frac{3}{4}$d ; 3 cases fine palish, 5s 6$\frac{1}{2}$d ; 14 cases good smoked block, 5s 4$\frac{1}{4}$d.
L.E. Muar (in triangle) Straits)	40 do	fine block, 5s 11d ; 11 cases fine darkish crepe, 5s 4d ; 21 cases fine block, 5s 10$\frac{3}{4}$d to 5s 11d ; 4 cases fine darkish crepe, 5s 4$\frac{1}{4}$d.
B.M. & Co.	17 do	fine amber sheet, 5s 8$\frac{1}{2}$d ; 8 cases good scrap, 4s 6d ; 1 case dark lumpy scrap, 4s 5d ; 2 cases rejections, 4s 8d ; 5 cases mixed darkish scrap, 4s 5d.

ONDON, March 1st, 1907.—At to-day's auction, 649 packages of Ceylon and Malaya plantation grown rubber were under offer, of which about 562 were sold. The total weight amounted to about 37$\frac{3}{4}$ tons, Ceylon contributing nearly 8, and Malaya nearly 29$\frac{3}{4}$ tons. The sale passed off with good competition for all grades, $\frac{1}{4}$d. to $\frac{1}{2}$d. per lb. advance on last sale rates being sometimes recorded for the finer kinds. There were several large invoices of fine washed sheet and crepe, amongst these being one from the Highland Estate amounting to nearly 13 tons, which was keenly competed for at from 5s 3d to 5s 8$\frac{3}{4}$d. Fine pale crepe was also in request, selling up to 5s 10d for finest, this being the highest price in the auction. There was more enquiry for unwashed scrap, which marked an advance of about 1d. per lb.—Plantation fine to-day.—5s 8d to 5s 10d, same period last year, 6s to 6s 2d. Plantation scrap.—4s 5d to 4s 8d, same period last year, 4s 3$\frac{1}{2}$d to 5s 3$\frac{1}{2}$. Fine hard Para (South American).—5s 1$\frac{1}{4}$d, same period last year, 5s 4$\frac{1}{2}$d. Average price of Ceylon and Malaya plantation rubber.—562 packages at 5s 5$\frac{1}{2}$d per lb., against 139 packages at 5s 10$\frac{1}{4}$d per lb., same period last year. Particulars and prices as follows :—

CEYLON.

MARK.		UANTITY, DESCRIPTION AND PRICE PER LB.
Clontarf	1 case	good darkish and dark crepe, 5s 2$\frac{3}{4}$d ; 1 case good scrap, 4s 6$\frac{1}{2}$d.
Kumbukkan	1 do	good palish scrap, 4s 7d. 1 bag good lump scrap, 4s 5$\frac{3}{4}$d.
Elston	1 do	good pressed scrap, 4s 5$\frac{3}{4}$d.
C.L. in triangle)	8 do	good palish to darkish crepe, 5s 6d ; 1 case somewhat similar, 5s 4d ; 5 cases similar, 5s 3$\frac{1}{4}$d ; 3 cases good darkish rolled crepe, 5s 3$\frac{1}{2}$d ; 7 cases good darkish crepe, 5s 2d ; 2 cases dark pressed crepe, 4s 9d ; 1 case block, 4s 5$\frac{1}{2}$d.
Suduganga	3 do	good dull biscuits, 5s 8d ; 2 cases similar, 5s 8d.
Kepitigalla	1 do	scrappy sheet and biscuits, 5s 7$\frac{1}{4}$d ; 2 cases rejections, 4s 7$\frac{1}{2}$d.
Culloden	3 do	fine palish crepe, 5s 9d ; 6 cases good palish and darkish crepe, 5s 4$\frac{1}{2}$d ; 1 case good dark crepe, 4s 11d ; 4 cases fine darkish biscuits, 5s 8$\frac{3}{4}$d ; 1 case very fine pale crepe, 5s 9$\frac{1}{2}$d ; 2 cases darker, 5s 9$\frac{1}{4}$d.
Heatherley	3 do	very fine pale and darkish biscuits, 5s 9$\frac{1}{2}$d.
Nikakotua	4 do	fine palish to darkish sheet, 5s 8$\frac{3}{4}$d ; 1 case dark, 5s 8$\frac{1}{2}$d.

Arapolakande	9 do	fine dark biscuits, 5s 9d; 1 case lighter, 5s 8¾d; 3 cases fine pressed scrap, 4s 6d; 1 case dark block, 4s 6¾d.
Ingoya	7 do	fine darkish biscuits, 5s 9d.; 1 case fine biscuits and blocked sheet and biscuits, 5s 6½d.
J. J. V. & Co. (I in diamond)	1 do	low scrap, 4s 5d.
Taldua	4 do	fine palish to darkish biscuits, 5s 8¾d.
Warriapolla	1 do	very fine pale Ceara biscuits, 5s 9d; 2 cases very fine pale and palish biscuits, 5s 9¼d; 1 case fine palish and darkish biscuits, 5s 9d; 1 case similar, 5s 8¾d; 1 case good scrap 4s 6d; 1 bag darker and heated, 4s 6d.
C. L. P. C.	1 do	Ceara biscuits and low scrap, 4s 9d.
Sunnycroft	1 do	good palish biscuits, 5s 9d; 2 cases good scrap, 4s 6d.
K.M. (in estate mark)	1 bag	scrappy biscuits 4s 8d; 1 bag scrap and rejections, 4s 8d; 1 bag dull Ceara biscuits, 5s 1d.
Ballacadua	2 cases	fine darkish biscuits, 5s 9d.
Tudugalla	6 do	low scrap, part sold, 3s 9½d; 3 cases dark scrap, 3s 9½d.

MALAYA.

MARK.	QUANTITY, DESCRIPTION AND PRICE PER LB.	
Sungei Krudda	1 cases	good sheet, 4s 6¾d; 1 bag pressed virgin sheet, 4s 3d.
B.R.R. Co. Ltd.	14 do	good washed sheet, 5s 8d; 1 case good dark blocked sheet, 5s 9¾d; 6 cases good block, 5s 9½d; 7 cases good darkish block, 5s 8½d.
C.M.R.E. Ltd.	14 do	fine palish crepe, 5s 8¾d; 5 cases fine palish to darkish crepe, 5s 7d.
Shelford	2 do	good amber sheet, 5s 8d; 2 cases good scrap, 4s 6d; 1 case good scrappy rejections, 4s 8d.
S.S.B.R. Co. Ltd. (in diamond)	2 do	dark pressed scrap (uncured), 4s 6d.
Highland Est.	11 do	fine washed sheet, 5s 8¼d; 5 cases similar, 5s 8¼d to 5s 8½d; 7 cases fine palish to darkish crepe, 5s 6¼d; 4 cases darker, 5s 5d; 4 cases good darkish, 5s 4½d: 6 cases good brown, 5s 4d; 49 cases fine washed sheet, 5s 8½d; 5 cases similar, 5s 8½d; 13 cases fine palish to darkish crepe, 5s 6¼d; 10 cases little darker, 5s 4¼d; 7 cases dark, 5s 3½d; 17 cases good brown and dark crepe, 5s 3½d; 32 cases fine washed sheet, 5s 8½d to 5s 8¾d; 4 cases darker and mouldy, 5s 8½d; 6 cases fine palish crepe, 5s 7½d; 3 cases good darkish to dark, 5s 3¼d; 1 case similar, 5s 3d; 9 cases good brown, 5s 3d.
T.E.P.	1 do	dark pressed crepe, 4s 8d.
T.E.S.B.	12 do	low scrap, 2s 9d.
A.M.R.C.	2 do	good scrap, 4s 7½d.
V.R. Co. Ltd, Klang F.M.S. (in triangle)	2 do	good washed sheet, 5s 8½d; 10 cases fine pale to palish crepe, 5s 9½d; 2 cases good palish to darkish crepe, 5s 6¾d; 1 bag good washed sheet. 5s 8½d; 3 cases good palish crepe, 5s 7¾d; 6 cases dark smoked block, 5s 4¼d; 1 case palish, 5s 2d; 1 case fine pale crepe, 5s 10d; 18 cases fine pale to darkish crepe, 5s 9¼d; 1 case similar, 5s 9d; 4 cases good palish to darkish crepe, 5s 7d; 5 cases darkish smoked block, 5s 3½d; 3 cases palish, 5s 2¼d.
S.R. Co.	21 do	good washed sheet, 5s 8½d to 5s 8¾d; 3 cases good darkish crepe, 5s 6¼d; 1 case good palish, 5s 7½d; 1 case good darkish, 5s 5¾d; 10 cases good dark, 5s 2¼d to 5s 2½d; 2 cases good brown, 5s 2¾d; 13 cases good washed sheet, 5s 8¾d; 3 cases good palish to darkish crepe, 5s 6¾d; 2 cases darker, 5s 3d; 1 case darkish, 5s 4d; 4 cases dark, 5s 2½d.
S.(in diamond) R.R.	2 do	good amber sheet, 5s 8½d; 1 case rejections, 4s 5¾d.
Yam Seng	10 do	fine amber sheet, 5s 8¾d; 9 cases good scrap, 4s 7d; 1 case scrap and rejections, 4s 6½d; 1 case rejections, 4s 6½d.
Teluk Batu	16 do	fine amber sheet, 5s 8¾d; 1 case pressed darkish smoked crepe, 5s 2½d; 6 cases good blocked scrap crepe, 5s 2¼d; 1 case dark block, 4s 4d; 1 bag rejected sheet, 5s.

G.K.K.B.	3 do	very fine pale amber sheet, 5s 9d ; 1 case rejections and ball scrap, 4s $6\frac{1}{4}$d.
R.S. & D. (in diamond) R	2 do	fine cut sheet, 5s $8\frac{3}{4}$d ; 3 cases scrappy rejections, 4s $7\frac{1}{4}$d.
S.P. (in circle)	1 do	dark scrap, 4s $5\frac{1}{2}$d ; 1 case darkish pressed sheet, 5s $8\frac{1}{2}$d ; 1 bag scrappy crepe, 5s 2d ; 1 bag dark pressed crepe, 4s 6d ; 1 case pressed sheet, 5s $8\frac{1}{4}$d.

EXPORTS OF PLANTATION RUBBER FROM CEYLON.

From 1st January to 4th February.

1907	$11\frac{1}{2}$ tons	1905	$2\frac{1}{4}$ tons
1906	$9\frac{1}{2}$,,	1904	$2\frac{1}{2}$,,

Exports from Singapore—1907, 1st to 28th January ... 36 ,,

GOW, WILSON & STANTON, LTD.,
LONDON.

CAMPHOR CULTIVATION.

There has been much talk of late in Ceylon planting circles concerning the possibility of camphor cultivation in that island, and many are anxious to learn whether operations are likely to prove profitable, especially in view of the extreme scarcity and high prices which now appear to be more or less permanent. Camphor has been cultivated for experimental purposes in Ceylon and India for a number of years, but not until quite recently has it been successfully produced. So far as we can learn, the planter has not the best methods of distillation at his disposal, and has not been able to extract camphor in paying quantities. This is well illustrated by the fact that nine months ago there were over one hundred acres under the camphor-plant in Ceylon, yet up to the present not more than a ton of crude camphor has been produced. Recently the Governor of Ceylon has been talking of the potentialities of camphor-culture, and since then there has been an unprecedented rush for seed. Concessions of land have been granted in Ceylon, and planting will shortly commence on a substantial scale ; and as the climatic conditions are said to be similar to those of Formosa, there seems every reason that the experiment should ultimately be successful. It appears, however, there is great difficulty in obtaining true camphor-seed from Japan, as, naturally, the Japanese are prepared neither to assist the planter nor to give away the secrets of their distillation. If it were possible to get hold of a Japanese or Chinaman actually engaged in the camphor-industry, the difficulty might be quickly solved, as the Ceylon planter has everything to learn regarding distillation. In other words, he has a certain quantity of raw material at hand, and is as yet unable to obtain an adequate yield of the crude product. Mr. Kelway Bamber, the Ceylon Government Chemist, has been at work for some time at Peradeniya, and has succeeded in perfecting an inexpensive still which it is hoped will render the process an easy one. The profit at present prices would be considerable, but a grower would probably have to take a much lower price than the ruling quotation of 350s. per cwt. The demand for camphor is only a limited one, but we believe the danger of over-production in Ceylon is remote, and that planters would be justified in going ahead.

Ever since the Japanese monopoly was established some eight years ago, the crude-camphor market has been more or less starved or only supplied with extremely limited quantities. This, of course, is not entirely the fault of the Japanese Government, as they have encountered many difficulties in working their monopoly in Formosa. Labour-troubles, native rebellions, earthquakes, and the late war have all contributed their quota in regard to diminished shipments. One fact, however, stands out prominent since the institution of the monopoly, *i.e.*, the refining of camphor in Europe and the United States has dwindled to a mere shadow compared with what it was a decade ago ; and, in spite of official denials to the contrary, the refining is gradually passing into Japanese hands.

With the advent of extremely high prices undoubtedly the consumption has fallen off considerably, and where possible the public for certain disinfecting purposes have had to fall back upon the less-esteemed napthaline, in which a large business is now done. This is, of course, only natural when it is considered that the wholesale price of refined bells in large quantities in the open market has been from 4s. to 4s. 3d. per lb. for over eighteen months. It was thought that after the Russo-Japanese war there would be a fall in price, but, on the contrary, the price rose to its present quotation, and at the moment the position is regarded as exceedingly firm. It must not be forgotten, however, that there have been some exceedingly dull periods this year, and at times the articles has almost " gone a begging," the extreme prices having frightened buyers.—*Chemist and Druggist.*

CAMPHOR IN CEYLON.

The interest which has recently been shown in the cultivation of camphor by a few Ceylon planters has led Mr. E. J. Young, managing director of the Rangala Co., to read a paper on that subject before the local Planters' Association. Although he does not add much to our knowledge of the subject, there are one or two points in his discourse worthy of comment. So far as Ceylon is concerned there is only one planter (Mr. Roydon Hughes) who has been able to extract camphor in paying quantities. Last year he had ten acres under camphor at a yielding stage, and the produce from this area when shipped amounted to 1 cwt. only, which was sold privately in Mincing Lane for 275s. per cwt. That is a price which should leave a handsome profit, and is certainly an inducement for extended cultivation. Mr. Young considers it necessary to have at least fifty acres under camphor in order to make it a profitable business, and even 100 acres would be still better. Many planters are afraid, however, of danger in over-production, and in this respect their bitter experience in cinchona and cardamoms is not likely to be effaced. We believe the danger is now more apparent than real. With the rise in the celluloid-industry the demand for camphor has gone up by leaps and bounds, and cannot be filled; while synthetic camphor is still a problematic industry, and a dangerous one at that. Under the present conditions of supply as regards crude camphor, planters need not hesitate, therefore, in taking up the cultivation seriously. Their aim should be to see that a product is turned out equal to the Formosan in quality, and that camphor extracted from the leaves and twigs of the plant is shipped separately from that extracted from the stem. Care should also be taken in regard to packing, as dampness affects the colour and lowers the market-value of the article. In 1895 crude camphor was selling in London at 70s. per cwt, but that was when the celluloid industry was in embryo. When the Japanese Government monopoly was initiated the price was fixed at 178s. per cwt., so that, should there be a recurrence of the most favourable conditions at some future date, it is difficult to see why values should drop below that figure. It is only natural that the present price of 350s. cannot be maintained, as when conditions are again normal in Formosa, and regular shipments are resumed, there must be a considerable reduction. Meanwhile, so long as Formosa practically remains the only source of supply, Ceylon planters may go ahead, for it will take more than a generation to place on the market sufficient quantities of camphor to upset the Japanese monopoly. Mr. Young in his paper points out that the camphor resources of Formosa are not " boundless and inexhaustible," they have disminished at least 15 per cent. in the last twenty-five years, and in the settled districts the tree is practically extinct. On these points some authoritative information was given in our issue of June 16. That the Japanese are doing their best to protect and promote the camphor-industry goes without saying, but this has had a beneficial effect on the broker, refiner, and consumer is another " story,"

In regard to what we said last week about the manufacture of celluloid in Japan, we now learn from a report of the French Consul at Tokio that the present holders of the camphor monopoly are negotiating to supply camphor to two syndicates who contemplate the manufacture of celluloid in that country. The first syndicate is British, with a capital of five million yen, and they propose to establish a factory either at Osaka or Kobe; the other is a Franco-Austrian syndicate, proposing to establish works at Misshima, near Shidyuoka.

The present position of camphor on the London market is exceedingly strong, as the available stocks are very small. It will be noticed from the drug statistics which we give in the Trade Report that there are only 567 packages of crude and refined in stock, compared with 852 packages at the corresponding period of 1905. Moreover, we understand that some 200 packages of this quantity are already sold, but not delivered, thus reducing the balance to about 367 packages. Very little was shipped from Japan during August and September, and a 10-per-cent rise on the already inflated prices is confidently predicated, as the United States have been large buyers on this market.—*Chemist and Druggist.*

DYES AND TANNING SUBSTANCES.

TURMERIC: ITS CULTIVATION AND USES.

Turmeric* is extensively cultivated all over India for its root-stocks, and is now found more or less wild in Jamaica, especially in the western districts. It is the well-known *haldi* universally used as a condiment with curry-stuffs and also as a dye, and is one of the most profitable of crops in India. The dye-yielding rhizome is harder and much richer in colour than the edible.

CULTIVATION.

The preparation of the soil necessary for turmeric is similar to that for ginger, but lands intended for turmeric need not be worked so fine. The usual planting time in India is about the 20th of May. The plants spring up in about a fortnight. One or two weedings are necessary, and care must be taken that the fields are not inundated. After about a year and nine months turmeric is lifted. When it is raised the first year, as is the practice in some places, the produce is less in quantity and inferior in quality.

PREPARATION OF THE ROOT-STOCK.

Various systems are apparently practised for preparing the rhizome for the market. Of Bengal it has been said: After the rhizomes have been dug out of the ground, they are freed from the fibrous roots and cleaned. They are then put in earthen pots, the mouths of which are to be carefully closed with earthen covers and cowdung. These pots are then very carefully heated. The turmeric is made to boil in its own juice, a process which gets rid of the raw smell of turmeric. It is then dried in the sun, the drying taking nearly a week, during the time the turmeric requires to be covered in the night to protect it from dew. In some places turmeric is boiled in water in which a little cow-dung is mixed."

Of the North-West provinces, Sir E. C. Buck says:—"When dug up the roots are boiled and dried in the sun; in this form they are sold in the Indian bazaars. When the dye is to be used the roots are again boiled and powdered while wet. A decoction is then made of this paste in water, in which the cloth is well steeped, being subsequently dried in the shade. In the Kumaon district the roots are soaked in lime-juice and borax before being powdered instead of being boiled." Of the Punjab, Mr. Baden Powell says the tubers are taken up in November and dried partly by the action of fire and partly by exposure to the sun. Of Coimbatore it is reported:—"The roots are carefully sized and separately boiled in a mixture of cow-dung and water, dried and sent to market."

CHARACTER AND VALUE IN COMMERCE.

There are two sorts of turmeric seen in commerce—the *round* and the *long*, but both are the produce of the same plant; the central rhizomes or rootstocks constituting the round, and the lateral or secondary rhizomes (*tubers*) the long; the latter are the more abundant. The *former* are roundish or somewhat ovate, usually from about one inch and a half to two inches in length, and one inch in diameter, pointed at one end, and marked externally with annular ridges. They are often found cut into halves. The *latter* are somewhat cylindrical, more or less curved pointed at the two extremities, frequently having on their sides one or more short knobs or shoots, about the thickness of the little finger, two or three inches long, and marked externally with annular ridges. Both sorts are yellowish externally,

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* *Curcuma longa*, Linn. Information from Dictionary of Economic Products of India; and Bentley and Trimen's Medicinal Plants.

very hard and firm, and when broken having a waxy-resinous appearance, and an orange-yellow or reddish-brown colour. The powder is orange yellow. Turmeric has an aromatic taste and odour somewhat resembling ginger, but peculiar. When chewed it tinges the saliva yellow.

The following is a quotation from the Market Report published in the *Chemist and Druggist* for 23rd September last:—

"Good Madras finger has been sold at from 17s. to 17s. 6d. per cwt. being steady, and Cochin split bulbs are quoted at from 7s. 9d. to 8s. per cwt., according to quantity."

DYE.

A special form of turmeric is grown for this purpose, namely, a harder root, much richer in the dye principal than in the ordinary condiment form.

The colour is only deposited in the rhizome with age, and hence, in all probability, the above mentioned forms have been obtained by a process of careful selection of stock observed to produce the colour freely. It is of importance, however, that the European merchant in purchasing for dye purposes, should see that he gets the hard dye-yielding form and not the softer aromatic condition, which is used as a condiment.

The rhizome is still largely used by the European dyers, though the fluctuation in the trade may be viewed as due to the development of the aniline industry. Professor Hummel says of it:—"Notwithstanding the very fugitive character of the colour it yields, it is still much used, especially by the wool and silk dyers for the production of compound shades—olives, browns, &c. It gives a bright yellow colour without the aid of a mordant, but when mordants are used with it, it yields other colours not unlike those obtainable from the yellow dye-woods. The colouring matter of turmeric is one of the few for which cotton has naturally a strong attraction."

Although turmeric is rich in colouring matter, its want of permanence is a hindrance to its application as a dye-material.

Sometime back the use of turmeric was almost exclusively limited to printing and dying silks. It is now employed to a vast extent in stuff-dying, forming an important constituent in certain compound colours, especialy the so-called "sour-browns."

FOOD

Turmeric forms one of the indispensable ingredients in curries, and is used for colouring confections, etc.

MEDICINE.

Turmeric contains about one per cent. of a *volatile oil*, to which its odour is due, some *starch*, a yellow colouring matter called *curcumin*, and other unimportant substances. The alkalies change the colour of curcumin to reddish brown; and boracic acid produces an orange tint; hence paper tinged with tincture of turmeric is largely employed as a test of the presence of alkalies.

Turmeric is not now used as a remedial agent, but is introduced into the pharmacopoeias as a test of the presence of the alkalies. For this purpose the British Pharmacopoeia directs unsized white paper to be steeped in tincture of turmeric and dried by exposure to the air. It is also occasionally employed in pharmacy in colouring ointments and other preparations.

Used as a stimulant in native medicine in India; externally applied in pains and bruises, and internally administered in disorders of the blood. Its use as an external applicant in bruises, &c., is perhaps its most frequent medicinal application. The fresh juice is said to be an anthelmintic. A decoction of the rhizome is applied to relieve catarrh and purulent opthalmia.—*Bulletin of the Department of Agriculture*, Vol. IV, July, 1906.

FIBRES.

Caravonica Cotton.

The following letters are of interest, but we adhere to our position that it is a pity to grow a perennial cotton in Ceylon when annuals fetching a higher price can be well grown and the ground left fallow for a few months to get rid of pests.—ED. *T.A.*

SAMPLES OF CARAVONICA COTTON.

5th December.

SIR,—I have the honour to inform you that I am sending you by the Orient Line steamer "Oruba" sailing to-day a box containing samples of Caravonica cotton, at the request of the Hon'ble Mr. H. L. Crawford, C.M.G. They are of the 'wool' and 'silk' varieties of the Caravonica cotton, and were grown in the North-Western Province by a member of this Society, Mr. J. W. C. de Soysa.

Mr. de Soysa informs me that he hopes shortly to be in a position to place his cotton on the home market.

C. H. BROWN, Esq.,
Cotton Broker, Liverpool.

I am, Sir,
Your Obedient Servant,
A. N. GALBRAITH,
Secretary, Ceylon Agricultural Society.

Worthing, 13th January, 1907.

DEAR SIR, I have received the following letters from Geo. H. Brown & Co., Cotton Brokers, Liverpool, in regard to the samples of cotton forwarded to them at my request:—

"We have received by the "Oruba" from Colombo two samples described respectively as *wool* and *silk* varieties of Caravonica cotton. The Secretary of the Ceylon Agricultural Society writes that they are the produce of Mr. J. W. C. de Soysa, who hopes shortly to be in a position to place this cotton on the home market. It will be an easy matter to report on the qualities of the cotton in a descriptive way, but valuations of a growth more or less strange as yet to the market here must be rather vague. I may say at once that both samples are of high grade and good staple, and if the bulk is consistent with them, they speak well for the care taken in raising the plant and ginning the cotton picked therefrom. With anything like present market conditions buyers could be readily found for such cotton if brought to port in marketable quantities.

I then wrote and asked if they could give even an approximate value for the cotton in question, and I received the following reply :—

"Not to go into fractions the samples of Ceylon cotton are worth 9d. a lb., and at to-day's (10th January) general gravity might fetch more if the growth became at all a familiar one in the market, but as you know values are fickle from season to season. Two years ago Middling American was quoted at 3·8d. per lb. To-day it is 6·02d. per lb., and what is more, the best sorts of American command a premuiun never known before over the common level, so that 11d. or even a shilling per lb. is not to-day an impossible figure for the very best. The current grades of Egyptian fetch 10d. to 11d. a lb. These prices are the more remarkable as both the American and Egyptian crops promise to be the largest ever known. On the other hand, the

increase of machinery and the buoyancy of trade have been unexampled. Sooner or later reaction will come and these prices must fall. Of that cotton growers must take their chance like the rest of humanity. But such cotton as is represented in the samples from the Agricultural Department can be certain of fetching a good price in comparison with all but the best fancy qualities of American, or on the other hand with very rough qualities of Peruvian which mix with wool."

The above information will, I hope, be of use to cotton growers. It will be seen that the report is distinctly encouraging.

Yours faithfully,

(Signed) H. L. CRAWFORD.

The Secretary, Ceylon Agricultural Society.

MAGUEY OR SISAL HEMP.

The cultivation of maguey in the Philippine Islands is, at the present time, attracting very widespread attention. In those provinces from which maguey has been exported for a number of years larger areas are now being planted. In other sections where this plant has been either unknown or unnoticed it is now being introduced. Numerous requests for information as to the essential details regarding this plant and its cultivation have been received by the Bureau of Agriculture. In order to supply this information in as brief and simple a form as possible, the following circular, printed in English, Spanish, Tagalog, Visayan, and Ilocano has been issued :—

Maguey.

1. What is maguey ?

Answer. Maguey is a plant having a short, thick stem which bears a large cluster of green, spiny leaves. These leaves yield a valuable fibre that is used in all parts of the world for making rope and twine.

2. Why should maguey be planted in the Philippine Islands ?

A. This plant flourishes through the long dry season ; it can be cultivated on poor, rocky, or sandy soils where no other crop can be grown ; it can be cultivated without the use of carabaos or other draft animals ; it is not injured by locusts or other insects ; it requires but little care and attention ; and it is a good paying crop.

3. In what provinces can maguey be grown ?

A. Maguey can be profitably grown in any province in the Philippine Islands. The conditions are particularly favourable in Ilocos Norte, Ilocos Sur, Union, Zambales, Cebu, Bohol, and Siquijor.

4. How is a maguey plantation started ?

A. A maguey plantation is started by setting out either the suckers which grow from the roots of the old plants, or the small bulbs which are produced on the flower stalk.

5. Where can these suckers and bulbs be obtained ?

A. They can be obtained in small quantities in nearly every province from farmers who already have maguey. Suckers or bulbs of sisal hemp, which is a superior variety of maguey, can be purchased in the Hawaiian Islands. Information as to where maguey and sisal suckers can be secured will be furnished by the Bureau of Agriculture in Manila.

6. When should maguey be planted ?

A. During the rainy season.

7. On what kind of land should maguey be planted?.

A. Maguey should be planted on hillsides, or on land that is well drained. It can be planted in dry, sandy soils, and it will grow particularly well in soils containing coral rock. It should *not* be planted on low, level paddy land where water will stand during the rainy season.

8. How should maguey be planted?

A. Maguey should be planted in rows 12 feet apart, with the plants 4½ feet apart in the row. This system will give larger plants, larger leaves, better fibre, and more fibre per hectare than the present Philippine method of setting out plants but 2 or 3 feet apart.

9. How is maguey cultivated?

A. Maguey requires but little cultivation. Two or three times a year the fields should be cleaned of weeds and grass, and the suckers which grow from the roots of the old plants should be cut out.

10. How long after planting can the first leaves be cut?

A. In three years where suckers are planted, and in four years where bulbs are planted.

11. How many leaves should be cut at one time?

A. Only one or two rows of the large, mature leaves around the base of the plant should be cut at one time. The Philippine system of cutting at one time nearly all the leaves on the plant is utterly wrong. This system weakens the plant, reduces the yield of fibre, and produces an inferior quality of fibre. *Cutting only the mature leaves will do more than any other one thing to improve the present condition of the maguey industry.*

12. How is the fibre extracted?

A. In the Philippine Islands maguey fibre is extracted by rotting the leaves in salt water. The leaves are left in the water for a few days and the pulp is then beaten and washed away, leaving the clean fibre. The fibre is then laid on the ground, or is hung over bamboo poles and dried in the sun. This system of rotting, or "retting," as it is called, is very unsatisfactory and produces a very poor quality of fibre.

13. What machinery is used for cleaning maguey?

A. Large machines which clean from 50,000 to 150,000 leaves per day, and cost from $6,000 to $9,000, are used in Mexico. A smaller machine which cleans 15,000 leaves per day, and costs $2,000 is manufactured in New York. Arrangements are now being made by the Bureau of Agriculture to bring one of these smaller machines to the Philippine Islands and to operate it in the different provinces.

14. What is the yield of fibre?

A. One plant will yield from 15 to 30 leaves per year. Where only the large mature leaves are cut the yield of fibre will be from 30 to 40 pounds per 1,000 leaves. With plants set out 12 by 4½ feet apart, or approximately 2,000 to the hectare, the annual yield of leaves per hectare is from 30,000 to 60,000, and of fibre from 900 to 2,400 pounds.

15. What is the value of maguey fibre?

A. The current Manila quotations for maguey are as follows:—No. 1, $15; No. 2, $12; No. 3, $9. Good machine-cleaned maguey fibre is equal in value to good sisal, which is worth only 1 to 2 cents less per pound than abaca.

16. What are the prospects for maguey in the Philippine Islands?

A. The production of maguey in the Philippine Islands has more than doubled during the past four years, and it is being more extensively planted every year. There is practically no limit to the area in the Islands that is suitable for this crop. Thousands of hectares of what is now waste land would grow good maguey. Thousands of hectares of poor, stony land, now producing miserable crops of corn and tobacco should be planted to maguey.

Certain improvements are urgently required. The more careful selection of suckers for planting; an improved system of planting; cutting only the mature leaves; and the introduction of fibre-extracting machines will give us more and better fibre. In Yucatan, where conditions of soil and climate are very similar to those found in parts of the Philippine Islands, more than $30,000,000 worth of sisal is produced every year. Maguey now ranks fifth among our exported products, and is exceeded in value only by abaca, copra, sugar, and tobacco. There is every indication that, with the introduction of improved methods, the cultivation of maguey will become one of the leading industries of the Philippine Islands.—*Philippine Bureau of Agriculture, Bulletin No. 8*.

FIBRE-EXTRACTING MACHINERY.

The introduction and the use of fibre-extracting machines is the most vital question affecting the maguey industry. Without such machines the cultivation of maguey is confined to limited areas near the seacoast, where the tide water can be utilized for retting the leaves. The fibre thus produced is inferior in quality and can never rank with sisal in the markets of the world. The introduction of machinery is, in fact, absolutely essential, if any considerable development of the maguey industry is to take place.

The principal obstacle to the immediate use of the large automatic machines in the Philippine Islands is, that few of our maguey planters are in a position either to purchase these machines or to use them to advantage. Maguey has been planted in small and widely scattered fields, and the facilities for transporting a large number of leaves to any one central point are extremely poor. An improved fibre extracting machine, to be profitably operated, must have such a supply of leaves. There are a few plantations, or localities, that will soon be in a position to use one of these machines, and the number will undoubtedly increase as the industry develops. What is most urgently needed at the present time, however, is a small machine of limited cost, weight, and cleaning capacity, that can be used on the sm farms.

The old Mexican raspador has been brought into the Islands, and has been given numerous trials and experiments. The results obtained have not been entirely satisfactory. The quality of the cleaned fibre by the raspador is excellent, but the amount of fibre obtained is hardly sufficient to justify the cost of operating the machine. The use of the raspador in its present condition cannot be recommended. A small machine, the "Pioneer," constructed on the same principle as the raspador but with certain improvements, is soon to be introduced into the Philippine Islands. If this machine does the work that it is claimed to do, it should be admirably suited to the present needs of the Philippine maguey planter. There are a number of different automatic fibre-extracting machines in quite general use in Yucatan. While each of these machines has its partisans, the "Prieto" appears to be in most general use. Ordinarily these machines do not clean up to their full capacity

because of the ignorance of the labour used to operate them. The machines used in Yucatan, and the cost of each, are shown in the following table, prepared by the American Consul in Merida :—

HEMP-CLEANING MACHINES IN ACTUAL USE UPON THE PLANTATIONS IN YUCATAN.

Machine.	Number of leaves cleaned in ten hours.	Number of men needed.	Actual horse-power.	Cost of Machine.	
				Mexican Currency.*	United States Currency.
Lanaux reformed ...	150,000	4	25	$7,000	$3,003
Prieto ,, ...	150,000	4	16	8,600	3,689
Torroella ,, ...	100,000	4	16	7,000	3,003
Villamor ,, ...	100,000	7	16	5,000	2,145
Stephens ...	150,000	3	70	†	†
Solis ...	9,000	3	9	2,000	858

—*Farmers Bulletin.*

NEW ZEALAND FLAX.

(*Phormium Tenax.*)

This useful and most profitable plant has been brought most prominently before the Victorian public recently by a Mr. Tait, who has an invention which is said to be a new method of extracting the fibre. As an effort has been made to float a company to work the same, considerable inquiries have been made for particulars as to what the plant consists of.

It is somewhat surprising the confusion that exists in the minds of many as to what constitutes New Zealand flax, and flax produced from the plant *Linum usitatissimum.* These plants differ widely. As the *Linum*, which was dealt with in the last issue of the *Journal*, is now favourably and well known in the State, and need not be further referred to, the only object in writing this brief treatise is to place a few facts before those who may be interested in *Phormium tenax.* The plant is well known in Victoria, and may be seen growing in most of our gardens. It is the principal plant employed for filling up all new plantations along streets, as it is hardy, and thrives well under most conditions.

The Agave varieties, which produce the well-known Aloe fibre, are also confused with the *Phormium tenax.* It will be readily recognised, as many vareities may be seen growing in yards and elsewhere.

NATURE OF THE PLANT.

Sir James Hector, in his valuable publication on *Phormium tenax*, which has passed through several editions, gives the following description.

"*Phormium tenax*, belonging to the Silaceous family of plants, was first mentioned as occurring in New Zealand by Captain Cook, who says :—'The country produced a grass plant, like flags, of the nature of hemp or flax, but inferior in quality to either. Of this the natives make clothing, lines, nets, etc.' Royle states that 'the leaves of the plant are perennial, hard, sword-shaped, and from 5 to 7 feet in length, with a flower-stalk rising 4 feet or 5 feet above them, and bearing a profusion of flowers, followed by triangular seed vessels, filled with flat and thin, black, shining seeds. It was introduced in the year 1798 into the South of Ireland, and has been found to flourish on the west coast of Scotland, though European winters are occasionally too severe for it.'

* The average value of the Mexican peso in 1902, according to the United States mint, was 42·9 cents.

† No more being made.

"This general description applies to the Phormium plant wherever it grows in New Zealand and Norfolk Islands, to which countries its natural range is confined; but it presents many minor variations in habit of growth, according to the climate and soil. These differences are not, however, so great as might be expected to occur in a succulent plant that ranges through 18 degrees of latitude, or from almost a tropical, insular climate to a country possessing a severe winter climate, with prolonged frosts and snowstorms."

CLASS OF SOIL SUITABLE.

It would be difficult to say what soil this hardy plant will not thrive in, but there are certain conditions which it must have to be successful. There is one in particular—that is sufficient moisture. It does not mean, as is generally supposed, that it wants a swamp, or a running stream, but a humid climate, so as to assure a constant and steady growth. In the dry, arid districts it will be found thriving well along the water channels, and where the soil is free it makes wonderful growth.

Much depends on the variety planted. The late Baron von Mueller describes both hill and swamp varieties. Sir James Hector mentions, in the publication previously referred to, fifty varieties which are recognised by the natives, but it is questionable whether many of these are not the same, or at least "Sports" or hybrids, as must be the case when plants are grown together and springing up from seed dropped. There is also in the work referred to an account of 25 acres being planted by the "Patea Flax Company," in which the number of varieties selected consisted of six, described as follows:—

Oue	Red edge
Atiraukawa	Light; bronze edge
Korako	Black edge, light colour in leaf
Huhiroa	Black, narrow edge
Atewheke	Scarlet edge
Tihore	Orange edge and keel

Unfortunately, whilst giving the names of varieties, they do not describe the class of land planted. To plant the hill varieties in low-lying land, or swamp varieties on the hills, would be a mistake.

Varieties should be selected to suit the soil and other conditions. My experience leads me to say that on the light-red chocolate soil in our high-lands, where the rainfall is good, any of the hill varieties make a growth fully equal to any described.

The same applies to light sandy or loamy soil where there is sufficient moisture, with drainage. The so-called swamp varieties will do well in a situation such as the banks of a running stream, or where the land is occasionally flooded, but will not thrive in low, stagnant pools. The best growth is made in reclaimed swamps, or where the swamp has been partly drained to the depth of one foot or so.

I cannot too strongly impress on the minds of those about to plant that the soil and the variety must be considered. There should be no difficulty in getting soil to suit the class of plants available. There are large tracts of country along the coast portion of it covered with cut grass and useless for any purpose. Much of this land, with proper treatment, would produce flax in abundance. This was recommended by the late Baron von Mueller over forty years ago, when distributing plants, &c., from the Botanical Gardens.

Phormium tenax is one of the most hardy plants introduced, and there is no difficulty in finding suitable soil in most part of the State.

PROPAGATION.

There are two methods by which plants may be provided, namely, "seedling" and "division of roots." The division of roots, or stools, is that generally recognised as being the best.

A well-grown plant will give from 50 to 100 sets, and by careful selection the best quality of plants could be secured. This is most important to those about to plant in this State, as it is generally recognised in New Zealand that only a portion of the plants growing are of sufficient value, from a fibre-producing point of view, for the labour incurred in its extraction.

When planting from one set, as described above, none but such plants as are approved of should be set out. The testing of a leaf or so of each plant is extremely simple, and need not be referred to here; but if this precaution is taken, as I have already stated, nothing but suitable plants will be selected.

The second system is raising plants by seed. This takes a much longer time in bringing plants to maturity. Whilst it may be considered a reasonable thing to expect a cutting in a plantation when from three to four years old, it would take much longer with seedling plants.

The method of raising by the officer in charge of the gardens of the City Corporation, on the bank of the Yarra, is simple, but effective. The seeds are sown in boxes; when they reach a certain stage they are potted out, and after remaining some time they are set out in beds. As these plants are raised for ornamental purposes only, the methods adopted by him will not answer so far as selection is concerned.

It is well understood that when a number of plants of the same variety are grown together that the flowers become hybridized, and that the seedling cannot be regarded as characteristic of the parent. No doubt, it is a much less expensive way to secure plants; but where, as in this case, a plantation is made for almost all time, it will repay the selection of plants when planting.

To those who have isolated plants growing, and these of sufficient merit to warrant their use, the seeds may be used with safety; but where there is any chance of the plants as described above, it would be unwise to adopt this course. I regret to say that in New Zealand, where this industry flourishes to such a large extent, very little attention is given to the selection of plants; although it takes a certain number of tons to produce a ton of fibre, it is recognised that by selection and cultivation the same weight of leaves will yield twice the amount of fibre. I cannot help thinking that in the establishment of an industry of this kind it is imperative that a thorough investigation should be made into the character and condition of the plants about to be set out.

METHOD OF PLANTING.

There is nothing to guide us in this respect so far as plantations are concerned. The crops of *Phormium tenax* are generally self-sown, and in their natural state grow without cultivation, but the principle is similar to various other plantations which have to be worked by manual labour. The character of the soil will have much to do with distance and other arrangement. The plants, when full grown, spread out, covering from 4 to 6 feet in width, and whilst they would be kept in check to a certain extent by an annual cutting, the planting would necessitate allowing sufficient room for the plants to develop thoroughly.

The plantation of the Patea Flax Company, referred to previously, was set out in rows 6 feet apart, and plants standing 6 feet between each other in the rows; but it is quite clear that where the land is suitable, and other conditions favourable,

that the ground would be completely covered, and plants become stunted from want of nourishment. If an additional two or three eet were left between the rows it would allow for the working generally of the plantation.

It must be borne in mind that there is a great bulk of material to be taken from a plantation. The yield is said to be from 12 to 18 tons per acre, and to get this away it would be necessary to have roadways, as in vineyards, say, every ten rows, to gather up the bundles of leaves.

The practice in New Zealand amongst the natives is to plant two or three sets in a hole. By this means, no doubt, an earlier return is secured, but it is questionable if the practice is advisable. When plants are somewhat difficult to get, it would be preferable to put in single plants, as their growth is rapid under favourable conditions, and in a short time the ground would be fully occupied. The set or sets are placed in a shallow hole, and the fibrous roots spread out when the earth is well tramped down. The depth of planting should not be more than three to four inches below the surface. The outside leaves should be cut back, but not the inner ones. This will enable the plant to become firmly established, when it will make a vigorous and healthy growth.

The advantage of a little care in planting, where both lines are kept, would considerably facilitate the after working. Phormium plants readily respond to through cultivation, especially in the earlier stages of their growth. In the case of planting trees, vines, &c., it is a great advantage to be able to cross-cultivate, and thereby keep the land in proper tilth. The wisdom of this has been generally recognised by orchardists and vignerons.

TIME OF PLANTING.

The most suitable season for planting is autumn, but when that is not convenient early spring may be adopted. With autumn planting, the sets become established by the heat retained in the soil, and will pass the winter over without suffering. Such plants may be also said to save a season's growth, as they are able to take advantage of the full spring season. But spring growth will answer equally well so far as the establishment of the plant is concerned. The plant is an extremely hardy one, and will adapt itself to conditions where other plants would perish. In the establishment of an undertaking like this, it is advisable, where practicable, to have all the soil thoroughly in order, and to plant out in early autumn.

GATHERING THE LEAF.

The plant consists of a number of shoots clustered together, each shoot producing a quantity of leaves, which strike up from the centre. The outside leaves, when not gathered, wither and die, and are of little value for fibre; but, when gathered annually, they are cut off near the bottom, leaving two or three centre ones uncut. It is stated that those who adopt this system gather an anual crop from the same plants, and the plant itself makes a much more rapid growth. This is reasonable, as it is well known that any plant deprived of its foliage is checked in its growth for some time. But this system is not universally adopted; in some cases the whole plant is cut off at one time, centre leaves and all. These are sorted, or graded, at the mill before treatment.

Where there is a plantation which has been carefully planted out, it is well worth taking every care in preserving it; and by cutting the outside leaves of each shoot, and leaving the three centre ones, less check will be given to the growth, and an annually gathering will be secured. The leaves should be cut off just below where the green portion terminates, as the soft thick parts do not work up well with the other portion of the leaf, and have to be recut at the mill before treatment. These, when cut, are bound up into sheaves of a size convenient to handle, and are carted to the mill, where they are sorted out ready for treatment.

THE YIELD.

The officials of the Department of Agriculture, New Zealand, state that from uncultivated land, from 12 to 18 tons of green leaves per acre are gathered, but from a properly planted and cultivated plantation, according to experiments made, upwards of 50 tons could be gathered, and that the yield of fibre from carefully selected plants would be greater. According to the experience of various mills in New Zealand, it takes from 5½ to 6 tons of green leaves to make one of fibre.

There are various methods adopted in New Zealand of gathering leaves. It is usually from private land that they are obtained, and the owners claim a royalty; in some cases 12s. per ton is paid for the leaves as they are carted to the mill. The cost of cutting and binding is from 10s. to 12s. per ton. In some parts, where the mills are worked in the close vicinity of navigable streams, the green leaf is delivered at a cost of from 20s. to 25s. per ton.

If the yield of leaves is 12 tons per acre, this will give two tons of dressed fibre at £20 per ton	£40	0	0
Cost of leaves delivered at mill—12 tons at 22s. 6d. per ton...	13	10	0
	£26	10	0

EXTRACTING FIBRE.

There are two methods of treating this product to extract the fibre—one by machinery, and the other by chemicals and machinery. The latter method has not been used to any extent, but is spoken well of by various writers. That the fibre can be extracted has been proved by me on various occasions. A firm in the city which has taken up the treatment of the Linum flax has produced good samples of fibre from the *Phormium tenax*. But the principal method of extracting the fibre is by machinery, and quite a number of various designs are in use in New Zealand. Most of these do good work. Recently the New Zealand Government gave a bonus for the encouragment of a new machine, and considerable competition took place.

The Commission appointed to examine into the merits of the various competitors have set forth the particulars of each in their report to the Hon. Minister of Agriculture, which is published in pamphlet form and distributed. This is interesting reading to those who contemplate in any way with Phormium. As to the cost of machinery, much depends on the amount to be treated. Some mills are put up to produce several tons of fibre in the week, whilst others aim at smaller productions.

The power employed is an important item in giving the cost of a "treating plant." One capable of producing, say, one ton or so of fibre per week may be set down at from £150 to £200; this is complete, without the power. There are, according to an official publication, about 400 mills at work in New Zealand. Some are worked by water power, others by steam, but little can be said of the machinery from the information at present available. From the experience gained in dealing with the production of the Linum flax, one of the most important features is to show that there is machinery available for its treatment when produced.

VARIETIES.

The following descriptions are taken from Sir James Hector's work:—

" *Harakeke* (Common Swamp Flax).--Leaves coarse, loose, drooping, points generally blunt; flower stalk large, 11 feet to 14 feet high, and 1 inch to 2 inches in diameter; pod short, erect. Grows almost everywhere, but attains its largest size (14 feet to 15 feet) on rich alluvial soil, by banks of streams. Many sub-varieties are found, some with dark blue-green leaves above and glaucous below, and some pale olive-green, or bronzy. Some varieties have also the butts of the leaves coloured with red for some distance up, while others are yellowish-green almost to the very base. When the plant is stunted, the flower-stalk is also small, and the best characteristic is the blunt point to the leaf.

Paretanivha (Yellow Hill Flax).—Leaves erect, slightly drooping at the tip, yellowish-green, generally with red or orange margins, slightly glaucous below, point acute: flower-stalk small, 4 feet to 8 feet high, and ½ inch to 1 inch in diameter; pod, short, erect; fibre very good, soft and glossy. Plant seldom more than 5 feet or 6 feet in height; grows generally on clay hills.

Tihore.—Leaves stiff, erect, narrow, never drooping at the tip, olive-green, glaucous below; points very acute, or cuspidate, pink at the butt; flower-stalk, 9 feet to 10 feet in height, and 1 inch in diameter; pod, erect or inclined. Seldom flowers, and still more rarely seeds. Plants seldom over 6 feet in height. Grows in rich, dry, alluvial land; never in swampy places. I have never seen it except where planted by the Maoris. I have here applied the name to that variety called "Tihore" by the Maoris throughout the Waikato, and which is probably identical with the "One" and "Tapato." It is best distinguished by its narrow, tapering, sharp-pointed leaves and erect, close habit. It grows so thickly together that I obtained 186 sets for planting from two bushes."

Phormium tenax that grows on high or low dry ground, though smaller is in general finer and more easily stripped than that found in swamps. Colonial rope-spinners prefer it, and are willing to give a higher price for it on this account." The above descriptions are somewhat difficult to follow, as far as identification is concerned. Unfortunately, no care has been taken to retain the namesof the varieties introduced here. They have been planted indiscriminately, as they are for science effect only.

PROFITABLE NATURE OF THE INDUSTRY.

The Minister for Agriculture, the Hon. George Swinburne, M.L.A., when visiting New Zealand recently, gave this matter attention. He gives an instance of one land proprietor receiving £9 per acre as royalty for the privilege of cutting leaves from his land. One instance is given in Sir James Hector's publication of 12s. per ton being paid as royalty for green leaves, so that, at the rate of 12s. per ton, and taking the yield at 15 tons per acre, this would give a return of £9.

These figures, possibly, are exceptional. Many instances are recorded of good returns being obtained from the yield of leaves without any effort on the part of the proprietor, and, with proper care in selecting the best varieties in planting, equal or better results could be obtained here.

The value of this industry may be estimated by the latest returns published of the imports of fibre and cordage in Victoria :—

Fibre, from all sources	£79,266
Cordage, binder twine, &c.	41,941
Total ...	£121,207

The exports of *Phormium tenax* from New Zealand totalled £730,803, of which the imports to Victoria of fibre amounted to £25,390, and of cordage and twine to £5,929. The average price of fibre exported from New Zealand during 1905 was £25 17s. 6d. per ton.

CONCLUSION.

In advocating the cultivation of this valuable fibre-producing plant, I feel confident that there is a great future for it, as the growing demand for this class of fibre is considerable. Binder twine alone would justify it being taken up in his State. But every care should be exercised in entering upon this industry, and none but the right class of plants secured, as a mistake in this respect would seriously retard its development.

Large tracts of suitable land are available for this purpose, and, beyond preparing, fencing, and planting, nothing further is needed, except an occasional stirring of the soil. Many of our capitalists, no doubt, would be prepared to take this matter up, if encouraged by some special condition by way of securing land for the purpose. The inquiries for information concerning this matter lead me to believe that something will be done in the way of planting before long, and it would be a mistake to neglect the best advice and assistance available.—*The Journal of the Department of Agriculture of Victoria.*

TIMBERS.

THE USE OF WOOD IN PAPER-MAKING. II.

The first time, perhaps, that wood was used to any appreciable extent in the manufacture of paper was when Koops published his book, in 1800; but at that period it could not be made to compete successfully against rags. The European wars had the effect of raising the price of rags at the beginning of the last century, so much so, that there was a law which prohibited the burial of the dead in linen shrouds. Mechanical wood, or mechanical pulp, as we know it to-day, is, as I have already said, produced by keeping short cut pieces of wood by hydraulic pressure against the surface of a rapidly revolving stone, and was the first form in which wood was used in any considerable quantity. Mechanical wood has very little felting power, and is only capable of producing a weak paper, which contains practically all the ingredients of the original wood, and from the time of its discovery up to the present it has only been used for lower class papers. It, however, constitutes the great bulk by weight of our paper-making materials, as a common newspaper contains upwards of four-fifths of this substance.

CHEMICAL PULP.

A great change took place in the manufacture of paper on the development of the sulphite process. This process consists in treating chips of wood under a pressure of about seven atmospheres with a solution of bi-sulphite of lime or magnesia for a period of from eight hours to three days. The first patent was undoubtedly taken out by Benjamin G. Tilghman, of Philadelphia, in 1867. His original specification practicaly covers the various methods employed by subsequent inventors. He started by boiling in lead-lined cylinders. Although an excellent fibre was obtained, the engineering difficulties rendered it necessary to abandon his original process.

The preparation of wood for the chemical process is somewhat similar to that employed in preparing the wood for grinding. The wood is brought from the river or from the stacks in the mill yard, sawn into suitable lengths, past through the barking machine, then through the knotting machine, afterwards fed into the chipping machine, which at a great rate reduces the wood into small chips. It is then screened, and any further knots which appear are removed, and then the wood is taken along by a conveyer from the screens to the top of the digester house, and fed into the digesters through the manhole at the top. I have seen, at the modern chemical pulp mills, in Sweden, Norway, Finland, United States, and Canada, digesters with a capacity of 15 tons dry pump, and I have heard of a mill in North Sweden with a digester which will carry at one cooking 20 tons of dry pulp.

THE PIONEERS OF CHEMICAL PULP.

The actual date of the invention of wood pulp is more or less problematical, as the evolution of wood pulp has undoubtedly extended over a very considerable period, but the reference to Tilghman may be accepted as established. Some years ago a very interesting correspondence appeared in Papier Zeitung, and Professor F. Fittica asserted that Mitscherlich was entitled to the honour of being recognised as the inventor of sulphite. The editor of Papier Zeitung apparently did not wish to share the responsibility for that statement, and I think the editor of our esteemed German contemporary was well advised in the view he took, and in the course of a very intelligent correspondence, various more or less authoritative people put forward the names of Ekmann, Tilghman, Rismuller, and others, and various information was forthcoming regarding priority, but the consensus of

opinion seemed to controvert Professor Fittica's original argument, and Wochen blatt mentioned C. D. Ekmann as the father of the sulphite industry. About the year 1872 a well-known publication, in discussing this particular matter, argued that it was due to Ekmann that the manufacture of Mitscherlick's cellulose on a large scale was rendered chemically possible. Prof. Fittica, however, who stuck to his guns in championing Mitscherlich, said that Ekmann did not operate with calcium sulphite according to Mitscherlich's process, but he used magnesium sulphite, a salt that was without value owing to its inconstancy, and, consequently, was of no technical consequence as compared with calcium sulphite, but subsequently Ekmann undoubtedly made a success of the magnesium sulphite process. However, his method was kept secret, so that even for that reason the same could not have been, in Fittica's opinion, used by Mitscherlich. In this connection it is worth while remembering that originally Ekmann's mill was in operation from 1874 to 1879, but was, of course, re-opened later. Fittica further stated that Tilghman was ahead of Mitscherlich, in so far as he used diluted sulphurous acid for transforming wood into cellulose, and it is significant that in the year 1866 Tilghman, in his patent No. 2921, mentions that "an addition of bi-sulphite of calcium to sulphurous acid is advantageous." However, it subsequently appeared that he had not used the salt alone, nor did he use the comparatively low temperature recommended by Mitscherlich. Moreover, he was unable to surmount the technical difficulties combined with these stated processes, and subsequently discontinued his experiments in the year 1867, after struggling for two years, and losing 20,000 dols. or over. In the year 1882, Ritter and Kellner took out a patent, and at this time Mitscherlich's factory in Munden was flourishing, having been started in 1875, and having made considerable progress, and the friends of Mitscherlich claim that the early manufactures, in a general and theoretical way, operated on the Mitscherlich principles, their process differing only in insignificant arrangements. Prof. Kirschner states in his work "Zellstoff," that F. A. Rismuller was the first to produce practically valuable cellulose on a considerable scale, under Mitscherlich's direction, in his factory. The name of O. Vogel, in Zell, is also alluded to by Prof. Kirschner, but there is no evidence that Vogel played any great part in the actual invention, although there is evidence that at one time he was assistant to Mitscherlich. and subsequently Vogel put down his own plant, which was arranged according to the Mitscherlich process. In 1884, in favour of Tilghman, Mitscherlich's patent No. 4179 was suspended by the German Court, and history would support Tilghman's contention. Some reliable authorities point out that sulphurous acid and its preparations had formerly been used only for bleaching cellulose wood pulp, and as late as 1867, after the issue of Tilghman's patent, Mr. Kreig —whose opinion is worth something—emphasised the fact "that wood pulp was not suitable for fine papers." Heldt states that in 1869 sulphurous acid should not only be called bleaching material, but bad bleaching material, because it imparts a yellow colour. At about that time, apparently new methods were discovered to change the wood into cellulose by the use of alkalies, and it is recorded that in 1872 considerable progress was made in this direction. A year later, in 1873, Menzies published a new process, according to which wood was treated in the damp state with chlorine, and in that same year Aussedat seems to have paid considerable attention to bringing wood and chlorine together in steam pressure, and Blyth and Suthby made combinations of both the first and last mentioned methods by first submitting the wood to the action of alkalies, and subsequently to high steam pressure, and this method was amplified and improved by Ungerer. Then Mitscherlich came into the market with a new arrangement to use bi-sulphite of calcium, and demonstrated that by a solution of calcium sulphite with strong acids, he prepared a solution of calcium di-sulphite. Following this success, and

assisted by the use of Swedish Patent No. 2939, he succeeded during that year in the performance of technical trials on a large scale, and in 1875 he obtained a directly prepared solution of di-sulphite such as he had previously obtained from a calcium carbonate. At that time he obtained the action of pure calcium bi-sulphite on wood, preparing the salt by running sulphurous gas over pieces of carbonate of calcium. Afterwards he constructed a tower for making the bi-sulphite of calcium. This method seems to have been considerably followed, and in 1866 a sulphite mill was built in America on Mitscherlich's lines, and according to a report from Thilmany (1894), the Mitscherlich process had been favourably adopted, and to such an extent that about that time there were forty boilers in operation in the United States and four in Canada; and the total yearly product in the States at that time was about 50,000 tons, On turning to Muspratt's technical handbook of that time, Mitscherlich is mentioned as the inventor of sulphite cellulose. Without committing himself to Stohmann, whose opinion has been freely quoted, it is significant that this authority mentions Tilghman and others, but merely to show that their experiments, as compared with Mitscherlich's success, had no weight, since they were not performed in a practical manner, and because they gained no technical success.

Stohmann, however, was subsequently reminded that the earliest edition of Muspratt contained no mention of Mitscherlich, although his mill in Munden was then in secret operation. Prof. Fittica, on this subject, summarises his opinion in these words: "Tilghman used the sulphurous acid, or he intended to use the same; but he did not use the sour calcium salt of the acid, and did not prepare or use the same in its pure state, in which condition only is it practicable for that purpose. For this reason, Tilghman had to discontinue, after ten years of restless activity." Ekmann's magnesium sulphite, however, undoubtedly and finally proved to be a suitable preparation. Several other experimenters also failed to comprehend the action of the temperature, so that also in this respect we must give Mitsccrlich the credit due to him. As might have been expected, Prof. Fittica's contentions provoked very considerable criticisms, and some rather severe comments, and returning to the fray, Fittica says in 1904: "In my history, in the manufacturing of sulphite stuff, I mentioned especially that it was Tilghman, besides others, who had already undertaken to make experiments to make sulphite fibre by means of sulphurous acids, but that it was Mitscerlich who provided a practical foundation to these experiments, and he must be called the first inventor in case the question arises as to a really practical invention. The germs of the idea of a new invention, a new principal, a new law, a new conception of the universe only take root gradually. Each idea has its forerunner, and these forerunners are present in every direction . . . . The person, however, who forms these ideas in the practical shape must be considered the inventor, because his forerunners have not performed a technical realisation. . . . Consequently," adds Prof. Fattica, "I repeat that it was Tilghman, besides others, who furnished the idea of manufacturing sulphite fibre, but it was Mitscherlich who added hand and foot to the practice, and, therefore, must be called the real technical inventor of the sulphite cellulose fabrication." Quite recently, Prof. E. Kirschner added a very important contribution to this controversy, and wrote that Ekmann, in Bergvik, Sweden, produced regularly large quantities of the valued sulphite pulp in 1874. That was long before Mitscherlich, and Prof. Kirschner adds that Fittica did not apparently seem to be aware that magnesium bi-sulphite, and also sodium and potassium compounds, produce not only the same effects in the sulphite process as calcium bi-sulphite, but would be even preferable to the latter, were it not for the higher cost of the bases contained in the former. Prof. Kirschner went at some length to substantiate his arguments by giving interesting chemical details, and went on to observe that "seeing that

Ekmann, in Bergvik, had not only magnesite, but also lime close at hand, and the latter could be bought at a lower price, we are justified in concluding that Ekmann was well aware of the technical conditions offered by a magnesium bi-sulphite liquor in contrast to one prepared from lime. From 1875 and onwards, Ekmann pulp was to be found in European markets. Later on in 1878-1880, the Ekmann pulp was certainly of a higher quality and fetched a higher price than the impure irregular material from Hann-munden, where the Mitscherlich process was being worked." Kirschner further controverted the suggestion that the poor qualities attributed to Ekmann pulp by Fittica were not justifiable, and he argued that Mitscherlich was largely a copyist of Rismuller and Vogel. To those who are sufficiently interested in the subject, a perusal of Ekmann's and Francke's patent specifications for the manufacture of sulphite pulp will probably be of considerable historical interest, and I am indebted to Mr. Clayton Beadle for a perusal of the same. This patent seems rather to bear out the contention that at a certain period quite a number of distinguished men were struggling to place what we now term chemical pulp on a commercial basis, and that Ekmann contributed considerably to the solution of the difficulty.

C. D. Ekmann (a perseverving Swedish chemist), who died last year at Gravesend, therefore appears, in my judgment, to have been the first to make a commercial success of the sulphite process. He set to work in 1872, using a solution of bi-sulphite of magnesia. His process was worked secretly until about 1879, when it was introduced into the Ilford Mills, near London; after which, in 1884, the proprietors of the patent erected large mills at Northfleet, where the process was conducted by the Ekmann Pulp and Paper Company, and was finally abandoned in this country in 1903-04, it being no longer possible to compete with foreign countries, on account of the cost of timber.

The great difficulty in the way of making the sulphite process a success was due to the corrosive action of the sulphite liquor. This liquor quickly eats through iron, and has a certain amount of action upon lead. Lead linings were at first used at Northfleet, but owing to the difficulty of "creeping," lead had to be abandoned. The "creeping" is due to the difference in the expansion of the lead and the outer lining, causing the lead to "packer." I am informed that the first lining came away completely, like a jelly out of a mould. Many linings were substituted, among them cement. The difficulty was finally overcome by introducing a brick lining.

Wood pulp for paper-making was manufactured at Guardbridge, in Scotland, very many years ago on the site of the Guardbridge Paper Company's mills. It was also made at Bruce's, at Kinleth Paper Mills. The Messrs. Tait have made wood pulp at their paper mills at Inverurie for over twenty years past. Then a plant was erected at inverkeithing.

In England, Ekmann made pulp at Ilford. Mr. Edward Partington, one of the most experienced authorities on wood pulp in this country made pulp for years at Glossop. The Kellner-Partington Paper Pulp Company also made pulp at their mills at Barrow-in-Furness.

Then there was another company at Goole—which made pulp in 1890, but is now discontinued—and the West Hartlepool Company, which also made wood pulp. Some seventeen or eighteen years ago, I remember being invited to the mills of the East Lancashire Paper Company, where in a small building I saw wood pulp being made by what was then known as the Graham process.

A Scotch friend tells me that the Guardbridge Soda Pulp Mill was erected in 1870-1, and it worked for about two years or so. The boilers were of Mr. Sinclair's patent vertical, having conical ends, the fire being underneath, having spiral flue so that the gases ascended and passed through an iron-funnel chimney on the top. To

prevent the burning of the wood, there was provided a perforated cage having $1\frac{1}{2}$ inch space between said cage and outer shell for the liquor. There was a down-take pipe about 5 inches diameter to take down the liquor through the centre of the cage. This down-take pipe was removable, so that it could be taken out when the boiler was being filled. These boilers were 10 or 12 feet deep, and about 4 feet diameter, the working pressure being about 200 lbs. per square inch. Caustic soda was used, and the wood was boiled off in three hours.

The Goole Company commenced making pulp in 1890, but has not been in operation for some time. The North Eastern Pulp Company also turned out pulp, but is not now doing so. Messrs. Brown, Stewart & Co. had digesters at Newton Paper Mills and at Dalmarnock Mills for making their wood pulp; but this also has all been discarded. This was about twenty years ago. In those days the cost by Francke's process of wood and chemical plant for the production of 30 tons of sulphite pulp per week was estimated at £8,000, and with the Ekmann process—then just at work at Ilford—£13,000 to £14,000 was spent on plant, machinery, and wood to produce 20 tons per week. The cost of raw wood to make a ton of paper at Hull or Liverpool was estimated at £5.

In the early days of sulphite manufacture I went to Sweden and studied the bi-sulphide process at Francke's mills. Mr. Edward Partington and Mr. James Galloway about this time visiting the same mills, with the view of adopting the process. Subsequently Mr. Parington erected a sulphite wood pulp plant at Glossop, and worked a system of his own. In 1844 Kellar took out letters patent in Germany for a wood pulp grinding machine, but for want of capital sold it to Voelter. J. Macfarlane, of the Canada Paper Company, told me that he first introduced wood to the country in 1874, that he offered some bass-wood to Bruce's of Kinleith, and was laughed at. He finally offered them a farthing per pound over and above the market price for the paper; the pulp was eventually accepted, and proved such a success that the Bruces, very naturally, kept the matter to themselves as long as possible.

The Partington process acquired by the American Sulphite Pulp Company about 1844 was the first to be made use of in the United States of America. It was also conducted in this country by the Kellner-Partington Paper Company, but was, I believe, abandoned a few years ago. Mitscherlich, who by the way, was Professor of Chemistry of Munich, began his experiments with the sulphite process about 1876, and later on went to Thodes Mill, near Dresden, and has already been referred to. He started commercially about 1881. Many lawsuits were fought in respect of the rival patents, which showed very close resemblance in their claims. Behrend, in 1883, disputed the validity of the Mitscherlich patents on the grounds of the priority of Tilghman British patents, and the German Board of patents concluded that the Mitscherlich process did not differ from that of Tilghman's to entitle it to protection. There were numerous patents in connection with the lining and the digester which we need not refer to in detail. The treatment by the sulphite process consists first of all in preparing the liquor. This is done by causing the vapour of sulphurous acid obtained by burning either "pyrites" (sulphide of iron) or sulphur in ovens, and conveying the vapour up from the bottom to the top of a tower of about 105 feet in height, packed with limestone—a spray of water is introduced at the top and trickles through the limestone. The vapour combines with the water to form sulphurous acid, which acts upon and dissolves the limestone, forming bi-sulphite of lime. In the Ekmann process, a stone consisting chiefly of magnesia is used, whereby bi-sulphite of magnesia is produced. The liquor standing at about 11° Tw., and containing about two-thirds of the sulphurous acid in the free state and one-third in combination with lime, is run into a sulphite

digester, which is closely packed with chips of the wood until the liquor just covers over the wood. The lid is put on, steam is introduced until the temperature slowly rises to about 100° C. This causes all the air from the pores of the wood to escape and the solution to take its place, and takes a few hours. The temperature is then increased by the introduction of further steam until it slowly rises to, say, 117°C.; 115° is about the temperature at which chemical action begins to take place; 120° is the maximum temperature above which it is unsafe to go. The temperature therefore must be maintained within these limits during the process of boiling. The progress is judged by withdrawing samples of the liquor and examining their colour, sedimentation, and by other means. When the process is complete, the digester is blown off, the pulp washed with hot water, after which it is put into potchers, where it is further washed, and then it is passed through screens for separating out any untreated particles, and collected in the machine in the form of sheets containing 50 per cent moisture, packed into bales for shipment.

If required in the bleached state, when in the potcher, it is mixed with solution of bleaching powder from 10-20 per cent of the weight of the material, emptied into "steeping" tanks. When the chlorine is exhausted, the liquor is allowed to drain away, and the bleached product restored to the potchers and treated in the same way as the unbleached product.

Chemical wood pulps now enter into the manufacture of the highest class papers, and such a degree of excellence has been achieved in this, that only an expert could tell the difference between a chemical wood fibre paper and an expensive all rag paper.

SODA PROCESS.

The heating is effected either by means of coils or live steam. When the latter, allowance must be made for the amount of condensation. Little makes the statement that the temperature can be raised quickly. I have, however, reason to know that with soft soda aspen the temperature has to be raised slowly and with the utmost care, and also lowered again. The filling of the boiler is similar to that of the sulphite; the full pressure is, however, reached as quickly as possible, and maintained until the end of the treatment, the pressure formerly adopted being from 60 to 75 lbs. per square inch, but latterly it vas employed at about 100 lbs. per square inch, and sometimes 110. The time of boiling is from eight to ten hours; as the pressure is increased the strength of the liquor can be somewhat diminished. Unlike the sulphite pulp that obtained by means of the soda process is of a greyish brown colour, whilst the liquor is a darkish brown and of a peculiar odour. This liquor contains the incrusting and resinous matters in combination with the soda as a soluble soap.

Caustic soda, being an expensive chemical, has to be recovered. This is effected by evaporating the liquor down to a thick syrup, after which they are make to flow into a revolving furnace, where they catch on fire, their own organic matters supplying a large amount of heat necessary for the incineration as well as for the evaporation of the weaker liquors. The evaporation is much economised by the adoption of what is known as the triple or quadruple effect evaporator, by means of which the water is removed at the least possible expenditure for fuel. The incinerated ashes as discharged from the furnace appear in greyish and blackish masses in the form of a sort of clinker. This mass, consisting of carbonate of soda mixed with carbon, is "lixiviated" or treated in hot water, whereby the soluble carbonate of soda goes into solution, leaving a black mud of charred and useless matter, from which the liquor is freed by sand filtration. The clear liquor standing at from 16—20° Tw., is heated in iron coppers, and causticised by treatment with caustic lime, whereby the carbonate of soda is converted into caustic soda,

and the caustic lime into carbonate of lime or chalk. The chalk forms a sludge at the bottom of the vessel, from which the remainder of the liquor can be removed by filter pressing.

The sludge is pumped into a filter press to remove the liquor still remaining, and water caused to percolate through to remove the last traces. A clear caustic liquor is ready to be used again in the process of boiling. The process of recovery results in a certain amount of loss of the soda, amounting to about 15 per cent. This has to be made good by the addition of a certain amount of caustic or carbonate of soda. Soda wood pulp is generally of stuff of the nature of sulphite, and though of darker colour, is, as a rule, easier to bleach. Of recent yeras the soda process has gone to a large extent out of use and has been replaced by the sulphate process. This process consists in treating wood chips in an iron digester with sulphate of soda containing in the first instance a certain amount of caustic. The process is conducted very much like the soda process. It is carried up to the stage of the recovery process in a similar manner; in the soda process, however, the recovered ash consists of carbonate of soda, whereas in the sulphate process the recovered ash consists of sodium sulphide and sulphate of soda. The liquor ready for use again consists of caustic carbonate, sulphide, and sulphate of soda. The process is cheaper than the soda process, because instead of making up for the loss of the soda by the addition of caustic or carbonate it is made up with sulphate of soda, which is a much cheaper chemical; sulphate passing through the recovery process is reduced by the organic matter to sulphide; a considerable amount of this sulphide is decomposed through the treatment of the wood, giving rise to sulphuretted hydrogen. The gases emanating from a sulphate factory render it necessary to conduct the process in districts where noxious factories are not interfered with.

A great deal of the wood pulp sold as soda pulp is, I am assured by a leading expert in reality sulphate, and he tells me the proportion appears to be increasing every year. On this subject I am unable to express an opinion, but I am quite certain the British paper-maker secures delivery of chemical pulp capable of being used for the purposes intended.—*Journal of the Society of Arts.*

EDIBLE PRODUCTS.

THE LEADING TEAS OF THE WORLD.—CEYLON.

By the late Herbert Compton.

Ceylon has this affinity to a cat that it seems to have nine (commercial) lives, and always to tumble on its feet. Spices, pepper, coffee, cinchona, cocoa, tea—all these products has it planted with more or less success one after another, and now it is head over ears in the latest planting speculation of rubber. But tea still holds current pride of place as the staple crop of the Colony, and its popularity with investors has only been under a temporary eclipse owing to the economic causes resulting from the excessive 12-cent duty imposed upon its importation into England. With the reduction, and at no distant date, the abolition of this duty, and with a Continental demand that must rapidly increase now that the tea duty in Germany has been reduced from 10 cents to 3 cents per pound, Ceylon tea has a bright future in front of it.

A generation ago coffee and Ceylon were almost synonymous terms. In 1870 the area planted with the bean amounted to 250,000 acres, and the outturn (stated in pounds) was about 120,000,000. Then came disease and coffee was wiped out. In the ame year there existed about ten acres planted experimentally with tea in the island. To-day the positions are reversed. The coffee area has fallen to 2,371 acres producing 93,000 pounds, whilst the tea area has increased to 380,000 acres (out of a total cultivated area of 486,000 acres in the whole island) and the annual crop is 160,000,000 pounds. These figures are the best advertisement for Ceylon tea. Incidentally we may note that cocoa is cultivated on 33,000 acres and rubber on 40,000 acres. On the shady side of the picture we have a heavy fall in tea values consequent on prodigal production. In 1883 Ceylon tea fetched from 33 to 44 cents per pound; by 1889 the value had fallen to 22; by 1897 to 15½; and in 1901 it touched the bottom price at 13½. Since then there has been a slight recovery and the 1904-05 crop averaged 15 cents.

The Ceylon planting-industry employs about 1,600 European superintendents and managers and 400,000 immigrant coolies in addition to local laborers. The wages of a cooly vary from 8 to 13 cents a day. The value of tea land is estimated at from $150 to $300 an acre, but very fertile areas have been sold for as much as $500.

The following list shows the distribution of Ceylon tea to the different consuming countries:—

	Pounds.
United Kingdom	96,000,000
Australasia	23,000,000
North America	16,000,000
Russia	12,000.000
China (for Russia)	3,000,000
Other countries	7,000,000
Total ...	157,000,000

With the general information afforded let us turn to more particular details concerning Ceylon teas.

The crop varies considerably in quantity, although not quite so much as the Indian crop. Taking an average it may be said that Ceylon teas are very much like a blend of Indian and China leaf. They lack the rich strength and pungency of the

Assam growth, but on the other hand they never descend to the common liquors noticeable in the crops of some of the inferior Indian districts, especially in the produce of the rainy season. Ceylon tea is silky and smooth to the palate, and has a characteristic flavour of its own, more or less developed according to the altitude and soil of the estate on which it is grown. The Tea districts are roughly divided into two groups, the "hills" and the "low country," but this, again, is a very arbitrary distinction, as the altitudes of the estates range the complete gamut from 100 to 7,000 feet above sea level, and it is difficult to say where the "low country" class ceases and the "hill" class begins. As in India the teas grown at the lowest elevation lack the flavour of those from the higher districts, but are rather stronger in cup, whilst the yield is considerably greater. The teas grown in the higher and highest districts possess a nice distinctive "Ceylon" flavour, but it never equals the flavour of the Darjeeling dictrict in India.

There is not the same variation in the prices of Ceylon teas as in those from India. Taken, for example, the last sale at the time of writing, those for the week ending the 13th of April, (1905) the Indian averages range from 7 to 27 cents per pound, whilst the Ceylon averages only range from 9½ to 23 cents. This fairly represents the comparative variations in the market values of the product of two tea-growing countries.

One advantage Ceylon tea certainly possesses over Indian tea, and that is its suitability for straight drinking, *e.g.*, without blending. The best teas in India have to be blended down; they are too strong and rasping to be consumed pure. On the other hand the Ceylon teas can be consumed just as they are. Not that they may not be improved by blending; that is very probable. But blending is a fine art, and it requires both a knowledge of the tea and of the water of the district for which the blend is required. The average American tea man might be cornered if he had to fix up a blend out of his head, or even from a technical book, and this would be awkward if he wanted to make a feature of a "pure Indian" or "pure Ceylon." With such an object in view, and buying on the market, he will find it safer to stick to Ceylon, although if he puts himself in the hands of a wholesale blending house he will probably get a better article in a blended Indian, such, for instance, as a Dooars flavored with Darjeeling, and fetched up with Assam, than in any straight tea.

It is difficult to give the intending buyer any hard and fast rules for selecting Ceylon teas. You cannot say to him, as of Indians, buy Dooars for usefulness, Assams for strength, Darjeeling for flavor, Cachars and Sylhets for the popular pot, and so forth, because all the Ceylon districts are muddled up together in a small topographical area, and a delicately flavored hill tea and a common quality low country tea may be grown within ten or twenty miles of one another. I have given a great deal of careful study to this matter in my desire to supply a general guide to the characteristic liquoring qualities of the various districts, and the best I can do for my readers is to list the districts according to their approximate altitudes. This will indicate, broadly speaking, whether the teas are flavory or merely strong, which often means a little common in Ceylons. By locating the district of the estate whose mark is up for bid an idea can be formed as to what class of tea its produce belongs :—

District.	Elevation above Sea Level. Feet.		Feet.
Nuwara Eliya	6,000	to	7,000
Upper Hewaheta	...		6,000
Maturata, Dimbula, West Haputale, New Galway	4,000	,,	6,800

District.	Elevation above Sea Level. Feet.	Feet.
Dikoya, Maskeliya, Ramboda, Uda Pussellawa	3,000 ,,	5,500
Lower Dikoya, Kellebokka, Knuckles, Rangala, Kukulu Korale, Medamahanuwara	2,500 ,,	4,500
Rakwana, Nilroupa, Hanbane, Dolosbage, Lower Hewahetta, Passara, Hunasgiriya	2,000 ,,	4,000
Wategama, Kadugannawa, Ambagamuwa	1,500 ,,	3,500
North Matale, Morawak Korale, Galagedara	1,000 ,,	2,500
South Matale, Dumbara, Kurunegala	700 ,,	1,500
Kelani Valley, Kegalle	300 ,,	1,000
Kalutara, Hanwella, Mahara, Mirigama, Henaratgoda, Weligama	100 ,,	300

Districts whose elevation varies greatly: Alagala, 700 to 2,700; Badulla, 1,500 to 5,000; Balangoda, 1,800 to 5,000; Haputale, 2,000 to 5,500; Kotmale, 2,000 to 5,000; Madulsima, 2,000 to 5,000; East Matale, 1,200 to 4,000; West Matale, 1,500 to 3,500; Monaragala, 600 to 3,500; and Ratnapura, 100 to 4,000.

Ceylon teas used to be all black "English Breakfast" teas, but the planters have turned their attention of late years to the manufacture of green teas for the American market. Although not completely successful, the Ceylon planter is such a go-ahead fellow that he is bound to hit off the right thing before long.—*Tea and Coffee Trade Journal.*

THE TEA INDUSTRY OF FORMOSA.

Opening the map of the Eastern Hemisphere, one will find an island lying to the west of the boundless Pacific, with the Philippine Islands in the south and the mainland of China in the west. This is no other island than the one to which the Portuguese, sailing in ancient days round the coast thereof, gave the euphonious and yet appropriate name of "Ilha Formosa" (beautiful island).

In the year 1895 the island was ceded to the Japanese Empire as the result of the China-Japan war, and has since been growing with years under the successful administration of the Japanese Government. The territory of Formosa is estimated to be about 15,000 square miles in area, intersected by a range of lofty mountains through nearly its entire length. The climate is semi-tropical to temperate towards the northern part, and the island is quite free from damage of frost and snow, with, however, an abundance of rain consequent on moisture continuously brought in by the north-easterly winds. The cold tide of the Pachi-li B ıy coming in its course into contact with the warm one in the channel of Formosa, uniformly gives rise to occasional fogs in the island. In the plains, and especially in the lovely valleys amidst the mountains, the soil is, as a rule, eminently good, containing rich organic clay and copious iron in its composition.

As has been described above, in all the conditions of nature, the island of Formosa can safely be looked upon as a most delightful realm for human habitation. True, all the portions of the island abound in inexhaustible natural resources as well as in sundry agricultural products. For example, camphor, tea, sugar and rice are among its staple ones. What stands foremost, however, in the lengthy list of these products, is undoubtedly the tea that has highly bright prospects for its future.

As for the origin of the cultivation of the tea-plant and of the manufacture of tea, we regret to announce that we have no authentic records at our disposal. According to some tradition, tea-plants are supposed to have been found growing wild on the hills of Formosa, while some tea experts insist that the shrubs were

originally brought over from China. The manufacture of tea was, it seems, first started after Chinese immigrants settled in the island, and has since gradually developed into the present flourishing industry. In 1861 the British Consul Robert Swinhoe, in a report to his home government, stated among other things that Formosa tea was shipped in great quantities to the mainland of China. Still it was at that time, in its early stage not being capable of competing with other industries. A few years later, an Englishman, John Dodd, who had established himself in the island, attracted by the hopeful condition of the tea trade, made enquiries among the tea-farmers as to the possibilities of the trade, and with most satisfactory results. He did everything in his power for the advancement of the industry, thus often making loans to the farmers to induce them to increase the production. The next year some purchases were made and shipped to Amoy, which brought good prices. It was from the year 1868 that the total export was prepared for shipment direct to foreign lands. In 1869 a trial shipment was made direct to New York in two sailing vessels. It was warmly welcomed there and sold at fairly good prices. The trade has since gone on steadily increasing in volume.

The Japanese occupation of Formosa in 1895 marked an epoch-making period to the tea industry of the island. The Formosan Government, in the interest of the industry, has organized the tea-tradesmen's corporation with a view to preventing the export of bad and adulterated teas, while considerably reducing imposts on tea and at the same time providing facilities of communication for its trade. Thanks to the energetic efforts on the part of the Government, the amount of production has greatly increased in recent years, so that it now forms the most important source of wealth of Formosa. A variety of teas, such as black tea and Souchong, are produced here; what goes abroad, however, under the general name of Formosa tea is, indeed, Oolong tea.

Formosa Oolong tea is the pure article and is free from all coloring matter. It is neither subjected to the great amount of manipulation and fermentation that black tea is, nor to the nonfermentation, and has, therefore, in its composition the excellent merits of various teas, besides its aromatic flavor. India and Ceylon teas are now evidently having a lion's share of trade in European and American markets at the expense of China and Japan teas. They can, however, have no serious effects upon Formosa's tea trade.

It may not, perhaps, be amiss to trace herewith the origin of the name "Oolong Tea," a common appellation for Formosa teas. A good long time ago there grew wild tea-shrubs on the hill called Weiye-San of Fokien, province of China. One day, early in the morning, a farmer living in the neighbourhood, went to the hill and found to his great amazement a huge, black snake winding itself around a tea-plant. Perceiving that there must be some mystic meaning connected with this strange incident, the peasant in question picked some basketfuls of the leaves from the shrubs, and for trial manufactured tea thereof. The result was that an excellent tea was produced, emitting a stimulating, fragrant flavor, a few cups of which were sufficient to convince him that it was verily a most delicious beverage. Upon this, he started the manufacturing work of the tea, christening it "Oolong," that literally signifies "Black Dragon."

When making Formosa Oolong tea, use a small, dry and thoroughly clean hot teapot to be filled with warm water. Put in one teaspoonful of the tea-leaves for each cup desired, pour on the required quantity of freshly boiled water, and let the receptacle stand from two to three minutes, with its lids closed. It will make a better tea if lightly mixed with milk or sugar Care must be taken not to boil tea-leaves and to keep them strictly air-tight. Let me give below a table as fur-

nished by a competent expert on tea, showing the quantities of the constituents of the two species of Formosa Oolong tea solved in his analysis :—

Constituents. Species of Teas.	Percentage. Fine.	Common.
Theine	1·968	1·933
Tannin	9·630	6·163
Albumin	42·822	34·620
Moisture	8·833	11·780
Ash	6·503	7·600

The average production of Formosa teas through all the seasons of the year amounts to 20,000,000 pounds, and the declared value of Formosa teas exported to Europe and America almost totals 10,000,000 pounds. The following figures show the export of Formosa teas collected on the central market of Daito-tei (Tuatutia) in the north of Formosa for the past seven years :—

Season.	Amount.
1889	16,346,440
1900	16,871,643
1901	15,934,951
1902	17,955,524
1903	20,073,417
1904	17,800,474
1905	19,641,430

As the numerical figures in the above table show, the tea industry in Formosa has now got on the right track of development and expansion. The Government of Formosa, forseeing the possible prosperity of the tea industry in years to come, and with a view to fostering its growth, had a few years ago established a tea manufacturing experimental station at Ampei-chin, a central tea producing district. The enterprise has proved a success. To tell the truth, the amount of tea manufactured in this factory during the year 1005 totalled 150,000 pounds, of which 3,000 pounds were shipped direct to the United States and the rest sold to the Daito-tei tea merchants by auction.—*Tea and Coffee Trade Journal.*

Ranawara Tea.

By C. Drieberg.

This preparation, sometimes called "Matara tea" is made from the leaves or flowers (or a mixture of both) of *Cassia auriculata*, a common weed in the dry country, known to the Sinhalese as *Ranawara*, and to the Tamils as *Avarai* or *Ponavarai*. From a commercial point of view, the plant is valuable as a source of tanning bark, but the medicinal use of the leaves dates back to a very remote period, and a decoction of them is prescribed as a blood purifier and laxative, as well as in the treatment of urinary disorders (particularly diabetis), and skin diseases.

An examination by the late Mr. A. C. Dixon, Sience Lecturer, Royal College, showed that the preparation contained 3·7170 of an alkaloid (not named), and 16·1770 of other nitrogenous substances, with 41·1470 of gum, tannin and saccharine matters.

At the Agri-Horticultural Show held at Moratuwa, in August, 1904, the "tea" was prominently brought to notice by Mr. Abraham De Mel of Panadure (since deceased) who exhibited it in packet form like ordinary tea (Thea).

With a view to ascertain the chemical constituents of the preparation, I forwarded samples as exhibited at Moratuwa to the Imperial Institute, in August,

1904. In his preliminary report dated 4th April, 1905, Professor Dunstan gives the result of chemical analysis as follows:—

	In samples recd.	In dry materials.
Moisture	9·6	Nil
Ash	5·2	5·7
Tannin	6·4	7·1
Alkaloid (probably caffeine) ...	·22	·24

The alkaloid constituent was obtained as a white crystalline product and said to be either "caffeine or of some closely related substance." The limited quantity of leaves available for the analysis made it impossible to identify the alkaloid which was found in very small proportion.

At the request of Professor Dunstan, who wished to make a more complete analysis, I forwarded further and larger samples in June, 1905. These consisted of (1) 7 pounds of the "tea" similar to what was sent previously, (2) 7 pounds in bulk of dried leaves, (3) 3½ pounds of expanded flowers, mostly dried petals, and (4) 3 pounds of unexpanded flower buds.

Professor Dunstan reported in November, 1906, that, though all the samples were examined carefully for caffeine, the alkaloid could only have been detected with certainty in sample No. 1, viz., the preparation described as Ranawara "tea."

Though careful microscopic examination failed to reveal the presence of ordinary tea leaves or dust in sample No. 1, Prof. Dunstan asked for a thorough investigation as to the possibility of caffeine having been introduced in the course of preparation.

In the absence of the direct testimony of the party responsible for the manufacture, enquiries were made from those likely to throw light on the point. The results of these enquiries go to corroborate the fact that no tea in any form was added, and there is evidence that Mr. De Mel himself said so before the Agricultural Society of Panadure. It is thus not understood how caffeine (which cannot be detected in the dried leaves) appears as a constituent of the prepared Ranawara "tea."

The manufacture of Ranawara "tea" is now being carried on in Colombo, and the stuff sold in neatly made up ¼ pounds packets by the Western Trading Company, Bambalapitiya, Colombo, whose manager (Mr. G. W. G. Gunawardana), informs me that there is a good demand for it.

THE GROUND-NUT OR PEA-NUT. III.

(*Arachis Hypogæa*, Linn.)

CULTIVATION.

It is in the Eastern United States that the greatest intelligence has been applied to the raising and harvesting of the crop. A description of the methods in vogue in Virginia may well serve as a basis for contrasting the manner elsewhere. The soil is reduced to a fine tilth, the preceding crop—maize, cotton, or tobacco—having been one which leaves the surface in a clean condition. Probably a rich supply of marl or gypsum, if not put on the land when under the former crop, is given. Then the seed, which has been left in the pods all winter, is shelled and its power of germination tested. The farmer is advised to make more than one trial, to test a few seeds indoors first, then a larger number in the open, and not to sow till he is satisfied that he can obtain a crop. As a further precaution it is necessary, when the shelled seeds have to be kept for some little time before sowing, to keep them in small bags or baskets, lest they heat and lose all power of growing.

The seeds are set by hand on the ridge, a bushel to a bushel and a half of pods (*i.e.*, 24-36 lbs.) giving seed enough for one acre. The ridges should be 2½-3 feet apart, and, when the plough has prepared them, an ingeniously simple machine known as the "dotter" is run along each pair of ridges before the hands, marking by means of spikes on its wheels the spot where each seed is to be set. The hands following place a single seed into each hole at a depth of 1½-2 inches, and cover it with the foot. Within seven to ten days from planting the seedling appears at the surface, and then any spots where failure to germinate has occurred are resown. The after workings are ploughings and weedings, three or four in number; in the second ploughing the earth of the intervening space is thrown towards the plants in order to help the pods to bury themselves.

The crop is sown in May, or at times late in April or in June; flowering begins in July and lasts a month. The plant can stand a good deal of dry weather. Harvesting is commenced in the end of September and continued through October. A plough with a narrow mould-board is run along each side of the rows and the soil round the plants loosened. Then the vines are lifted by hand, shaken free of earth, and left for a day or two to wither. After this the plants are placed round stakes into small shocks, under, and often also over, which is laid a board as protection from the moisture of the soil or from rain. Thus left the pods are cured in the air. The last process is to pick the nuts, a troublesome piece of work done by hand, which is accompanied by grading and cleaning the pods for market. There also exist factories which buy the pea-nuts, clean and grade them, and sell them again. In doing this "pops," or empty pods, are removed. Such empty pods are said to be most abundant when there is a lack of calcareous food in the soil, or as an effect of dry weather.

Pods which remain in the soil are picked out as far as possible on ploughing the land, and hogs turned on to grub out and feed on what is left, lest the plant become a tiresome weed in the next crop. The hay, too, is saved in as good condition as may be for a food for animals. Modifications of this method are commonly practised. At times the ridge system is forsaken, and planting done on the flat. As is well known the relative advantages for the two systems depend chiefly on the depth of the soil and amount of moisture available. Various mixed manures are given; and the distances between the rows varied with the variety chosen and the fertility of the earth. Quite recently a little attention has been directed to the culture on irrigated lands (see *Bulletin Florida Agricultural Station*, 26, 1899, p. 26), but the results are not to hand.

On land new to pea-nuts the crop is usually heavy, and the ridges are at least three feet apart. After a few years under pea-nuts the growth becomes less vigorous, and the rows may hardly meet at a distance of 2½ feet. A striking contrast to this is the custom in Gambia to sow the rows a foot apart. Here the land is ploughed and the seed dibbled in on the ridge as in the States. The standing crop is weeded, and ultimately ploughed up. In Angola, Monteiro tells us (*op. cit.*, p. 129) the ground for pea-nuts—good soil in a river valley a little way inland where the comparatively arid coastal strip ceases—is cleared and the weeds burned; then, with a primitive little hoe, women stir the soil to the depth of a few inches, and the seeds are dropped in and covered up. Put in the ground in October or November, the crop is not removed until July or August, though the nuts are ready to be eaten green in April.

In India care is taken to get the soil into a good state of tilth, and as in the United States lime is regarded as a valuable manure. Subba Rao (*l.c.*, p. 226) says that silt containing lime to the extent of 22 per cent. was applied at the rate of 100 cart-loads per acre when the land of certain villages was first brought under

ground-nuts, and afterwards at intervals of a few years. Animal manure is regarded as beneficial only when applied to the preceding crop. Ashes are largely used, at the rate of 10 to 30 cart-loads per acre, a cart-load being about a ton. Indigo refuse is rarely used. It is considered that organic manures do harm rather than good if there be a long drought after application.

Seed required for sowing is kept in the pods until required. It is recognised that it will not keep for more than a year, and that it must be well looked after, it being desirable when the pods are in large quantities to dry them once a month. As a rule seed is shelled before sowing, but this is not always done, for sometimes one-seeded pods are picked out and sown. Shelling is done if possible not more than five days before sowing, and requires great care in order not to injure the seeds. Women perform the task, and the price paid for shelling for seed is thrice that for shelling for commercial purposes. Sowing on unirrigated land is done between the middle of May and the middle of August, but chiefly between mid-June and mid-August. On irrigated lands the sowing does not as a rule commence till August and is continued till October. The seed is always sown thickly, 90 or as much as 112 lbs. going to the acre. The seed is sown in the furrows made in ploughing, is always hoed in, and the fields watched against the depredations of jackals, crows, etc. It is hoed by hand during growth, and watered in January or earlier if necessary. In one place it is the custom to trample down the stems to bring them nearer to the soil.

The crop matures six months after sowing ; the haulms, if forage is scarce, may be then grazed or cut for fodder, or the land ploughed and the plants lifted. Any pods on the haulms are then plucked and added to those gathered from the soil during successive ploughings or by digging. If within a week after the haulms have been gathered on unirrigated land the soil be not dug up and the ground-nuts plucked, it is said that the seed will not be good for sowing though good enough for other purposes.

Heavy rain at the time of harvest causes the seeds to germinate in the pods and great damage to the crop, including the hay. A labour-saving device which may injure the pods is in use in some parts on irrigated ground. The ground, which must be dry, is ploughed and then flooded ; the pods, if perfectly dry, float, and can easily be swept with a broom to one corner of the field. In such a course the pods are allowed to dry for fifteen days between the ploughing and flooding, for, unless perfectly dry, they do not float, nor in any case will they float for long.

In India the produce rarely comes to the market unshelled. The pods in shelling are cracked by being beaten with a stick ; the shelled seed is then winnowed and the shells used as fuel or as manure or are wasted. "Kernels " are generally sold by weight, and to increase their weight the ryots add water to the pods before shelling them at the rate of about 16 Madras measures for 1,400 Madras measures of pods.

The details of commercial cultivation in China are unknown. The nuts ripen at Cheffo in October (Williamson, *Journey in North China*, London, 1870, ii., p. 438); a light and sandy soil is chosen for their growth (Hosie, *Three Years in Western China*, London, 1890, p. 83). The earth in which they have grown may in the harvest, after a preliminary ploughing, be passed through a bamboo sieve lest any nuts should be lost (B. C. Henry, Lingnam, London, 1886, p. 239), and after the extraction of the oil the refuse is used for manure (Williams, *Middle Kingdom*, London, 1857, ii., p. 105).

YIELD.

In Virginia the yield formerly stood at 50-75 bushels of pods per acre ; this is equivalent to 1,200-1,800 lbs. It has since fallen immensely, and we read (U. S. *Department of Agriculture, Farmers' Bulletin*, No 25, p. 4) : " Within the last few years this crop has ceased to be as profitable as heretofore. The method of culture—the

annual planting of nuts on the same land, the complete removal of all the vegetation from the land, and the failure to replenish the soil by means of fertilisers—has been a great factor in reducing the profits of the crop, so that now instead of an average of 50 bushels per acre, with frequent yields of over 100 bushels, the average is not over 20 bushels, while the cost of cultivation has been but slightly reduced." Undoubtedly *Arachis hypogæa* is a most exhausting crop. Cultivators in America knew long ago that their second crop was less vigorous than the first and drew the rows closer together; but the exhaustion of the soil has been allowed to reach the extreme above depicted. Under these conditions the trade is maintained as it is, chiefly by the tax on imported nuts.

The yields obtained in the United States are far exceeded under irrigation in the tropics. Subba Rao gives the upper limit for Madras as 5,000 lbs. to the acre on unirrigated land, but the most common yields ranged between 180 and 720 lbs. *i.e.*, 7·5-30 bushels.

In Semler's *Tropische Agrikultur* (2nd ed. ii., p. 461) the yield in the Argentine is given as about 1,250 lbs. to the acre.

Holtze obtained at Port Darwin in North Australia 3,024 lbs. to the acre (Mueller, *Select Extra-trop. Pl.*), Paillieux and Bois (*Potager d'un Curieux*, Paris, 1898, p. 32) give the yield in Senegal as 2,000 kilogrammes per hectare, *i.e.*, 1,780 lbs. per acre. In his experiments in South France, mentioned earlier, M. Chaise obtained the large yield of 2,200 kilogrammes per hectare or about 1,960 lbs. (Heuzé, *op. cit.*, p. 139).

Experiments have been tried in Florida with this plant on irrigated land, but the yield is not known to us. One thing is very evident, that the size of the crop depends largely upon intelligent cultivation. The yield of haulms per acre is given by Subba Rao (*l. e.*, p. 275) as one ton per acre, by Handy for the United States as 1-2 tons per acre.

CONCLUDING REMARKS.

We have followed the history of *Arachis hypogæa* from its discovery by the early colonists of the New World to the present time, and have seen reason for tracing its appearance in Africa to the Portuguese, who traded on the Guinea Coast; we have noted its early and obscure history in Asia, and have seen how widely it is now acclimatised, and what a great part of the world is capable of producing crops of it; even in Central Europe this is possible.

Then, when the scarcity of olive oil demanded a substitute, France holding the chief trade in oil-seeds not only came forward as the market for ground-nuts, but her settlements obtained the export trade, and Gambia, Senegal, Pondicherry, and in a measure Algiers, prospered by it. Our neighbouring English possessions were not long in following suit, British Gambia gaining by proximity to the French settlements, and Madras profiting through Pondicherry. The rapid growth of the trade was most marked. At first West Africa supplied Europe, then nuts came from India, and even China and the Argentine, and now in addition there is an increasing importation from the Mozambique coast; the latter grows, while India withdraws from the competition.

Marseilles, from the first the chief market for ground-nuts in Europe, and still chief, despite the growing trade of Hamburg, London, Rotterdam, and Genoa, is undergoing a crisis in its oil trade, and this, because of its connection with the decreased production of India (see page 186), demands our attention.

Since 1894 the importations of oil-seeds by Marseilles have fallen; in 1897 41 per cent (16 out of 39) of the oil mills of the city were closed, and the report for 1898 (*Compte Rendu de la situation commerciale*, p. 77) tells us that the condition of the

oil trade was growing less hopeful. The difficulty of obtaining material (a result of local prices) and the flooding of the market with American cotton-seed oil are cited as causes. In fact the competition, not only in regard to cotton-seed oil, but in other oils, and with European ports, has proved too severe for Marseilles. Year after year the price offered for raw material has been reduced in order to meet the falling price of the oil. With other oil-seeds ground-nuts have fallen, and the price for unshelled nuts, which in 1877 stood at 48 francs per 100 kilogrammes, in 1898 stood at 30, and in 1895 had been as low as 22½ (*Compte Rendu*, 1898.)

The decreasing interest of Madras, Bombay and Pondicherry, is traceable in a large measure to these falling prices, and also undoubtedly to the deterioration of the crops due to exhaustion of the soil. On p. 197 it was pointed out how crop after crop wears out the land. No wonder considering the richness of the material taken off in the harvest! As the farmers of Virginia have been forced to recognise land which once yielded 50 bushels per acre presently grudgingly produces 20, and so too with the successive crops of the Indian ryot. Freight has operated against the export trade of India. To save the considerable addition of bulk made by the husk the native has shelled his produce before shipping it, and that carelessly; fungi and bacteria thereupon commence their ravages on the broken kernels, producing deterioration which, measured by Marseilles prices, is expressed in the following table. It is calculated from data in the *Compte Rendu* for 1898, and by allowing that the husk removed takes 23 per cent. from the weight :—

PRICES AT MARSEILLES IN FRANCS PER 100 KILOGRAMS.

Year.	Undecorticated.	Estimated cost of 100 kilos of kernels in undecorticated nuts.	Decorticated.
1875 ...	31	40·3	38
1876 ...	31·5	40·9	40
1877 ...	34	44·2	49
1878 ...	33·5	43·5	42
1879 ...	33	42·9	39
1880 ...	36	46·8	39
1881 ...	33	42·9	34
1882 ...	32·5	42·2	31
1883 ...	35	45·5	32
1884 ...	33	42·9	33
1885 ...	25	32·5	33
1886 ...	22·5	29·2	26
1887 ...	25	32·5	28·5
1888 ...	27·5	35·7	28·5
1889 ...	25	32·5	28·5
1890 ...	25·5	33·1	27
1891 ...	27	35·1	28·5
1892 ...	26·5	34·4	28·5
1893 ...	22	28·6	27
1894 ...	17·5	22·7	22·5
1895 ...	18·5	24	22·5
1896 ...	18	23·4	26
1897 ...	22	28·6	30
1898 ...	22·5	29·2	30

The cake resulting from the expression of seed, much injured by fungi and bacteria is, like the oil, rancid, and if, as is probable, the fungi again assert themselves after expression, loses its valuable fatty constituents by degrees. "Ritthausen and Baumann have shown that a great loss is caused by fungi

in other oil-cakes; *e.g.*, two samples of rape-seed cake containing 10·53 and 8·5 per cent. of oil contained after two years only 1·98 and 1·87 per cent. when overrun by fungi." (Biffen in *Annals of Botany*, 1899, p. 372.)

Here lies the reason why cake from Indian seed is more or less condemned. It must be confessed that the product is not sent into the market in the best condition; and moreover the practice of increasing weight by adding water or of gathering the nuts by flooding the land or the storage which may be necessary between the shelling and shipment cannot but be detrimental. Obviously, then, the sooner the crop finds its way into the oil mill, the better the oil and the cake. The short voyage between Gambia or Senegal and European ports is greatly in favour of these countries; but the existence of oil mills in India, in China, and now at Chinde in the Zambesi delta, all places with an increasing output, indicates the possibility of the extension of crushing in the centres of production.

That there is a demand for the oil appears from statements to the effect that in the making of a firm hard soap other oils cannot readily replace it. As a table oil its use is wide, and one result of the large imports of cotton-seed oil into Europe has been to cause more of the Marseilles mills than hitherto to turn their attention in this direction. The big importation of undecorticated ground-nuts into Marseilles in 1898 while showing the demand, is probably an effect of this.

The Chamber of Commerce of Pondicherry aware of the decrease in their trade—for not only has the acreage under the crop diminished, but a greater percentage of the output of India has been diverted to other ports—has commenced to experiment by the introduction into India of new seed; and the Government of Madras is moving in the same direction. It has been noticed that fields sown with seeds imported from the Mozambique coast have proved satisfactory results, while neighbouring crops sown with Indian seeds have been very poor. More experiments are needed; in the absence of any certain estimate of the relative values of different races it is impossible to foretell what the results will be.—I. H. BURKILL, in *Kew Bulletin.*

A METHOD OF PREVENTING THE RAPID DECAY OF RIPE FRUIT.

In Vol. XII., p. 305 of the "Journal of the Board of Agriculture," an account was given of certain experiments conducted in the Jodrell Laboratory, Kew, with the object of ascertaining the relative value of various substances in preventing the rapid decay of ripe fruit. These experiments were based on the fact that the primary cause of decay and rotting of ripe fruit is in most cases the presence of the germs of fungi, yeasts, bacteria, &c., on the surface of the fruit and not—within a definite limit of time—to any inherent tendency on the part of the fruit to decay. Among the various substances experimented with, commercial formalin (= formaldehyde, 40 per cent.) proved to be most suitable, on account of its efficiency, cheapness, and ease of application, and because of the entire absence of danger in its use. The method of treatment explained in the article quoted above is here reproduced.

"In the case of fruits where every part is eaten, as strawberries, &c., the fruit should be immersed for ten minutes in cold water containing 3 per cent. of commercial formalin. On removal immerse the fruit for five minutes in cold water, and afterwards place it on wire-netting or some similarly open material to drain and dry. When the fruit has a rind or 'skin' that is not eaten, the immersion in water after the treatment in formalin solution can be omitted with advantage."

During the present season a second series of experiments have been conducted at Kew, for the purpose of checking the results previously obtained, and of experimenting with other kinds of ripe fruit. No special selection was exercised in

procuring the fruit for experiments. The plums, cherries, grapes and pears were purchased at a local fruit shop, and the gooseberries and bananas were obtained from a street vendor. In each case a certain portion of the fruit was treated with formalin; this was placed alongside an untreated portion on a plate of glass; the two were covered with a bell-jar, and exposed to the ordinary temperature of the laboratory.

The following table shows the number of days that treated fruit remained perfectly sound and free from mildew, after the untreated check fruit had become covered with mould and quite unfit for use:—

Plums	Damson	9 days
	Victoria	5 ,,
Bananas		10 ,,
Currants	Black	5 ,,
	Red	4 ,,

The following table shows the kinds of fruit used last year for testing the preservative properties of formalin, and indicates the number of days during which treated fruit remained perfectly sound, after the check or untreated fruit had become unfit for use. The first column of figures refers to last year's experiments, the second column to this year's corroborative experiments:—

Cherries	7 days	8 days.
Gooseberries	7 ,,	6 ,,
Grapes	4 ,,	6 ,,
Pears	10 ,,	9 ,,
Strawberries	4 ,,	5 ,,

It is important to remember that all the kinds of fruit experimented upon were quite ripe and had been exposed for sale, and were consequently exposed to infection, and that in some instances they were more or less bruised. With fruit carefully gathered and treated at once, the duration in a saleable condition might be anticipated to extend over a longer period than is indicated by these tables.

In the case of apples that are just pitted with disease, treatment with formalin proves of service. Apple rot, caused by the fungus called *Gloeosporium fructigenum*, Berk., is very destructive to ripe fruit, on which it first appears as minute scattered spots on the skin; these spots rapidly extend and form large, brown sunken patches; within a very short time this fungus reduces the fruit to a brown, rotten mass. A dozen apples showing the first stage of this disease were immersed for a quarter of an hour in a solution of formalin of the strength given above, and afterwards dried. This was done during the last week in August; the spread of the diseased spots was completely arrested, and the apples are still—end of November—in good condition. A dozen similarly-affected apples, collected at the same time but not treated with formalin, were completely rotten by the end of September.

By employing the method of treatment described, pitted or slightly diseased apples can be kept in a condition fit for use for several weeks longer than when no treatment is applied. This is a point of some importance both to grower and fruit dealer. In the case of cottagers, and others who store a certain quantity of apples for winter use, it would well repay the very small cost and trouble incurred to treat apples previous to storing. The method is simple; put ten gallons of water (preferably rain water) into a cask or a zinc bath; add three pints of formalin: mix thoroughly; then immerse as many apples, contained in a net or loosely-woven sack, as the water will cover. The fruit, after remaining in the solution for ten minutes, the sack being partly lifted up two or three times to ensure every part of its contents coming in contact with the liquid, should be removed from the sack and placed on a layer of straw, hay, or some suitable substance to drain and dry. It is not necessary

to immerse in water, after their removal from the formalin mixture, apples that are intended for storing. Plums, strawberries, and other soft fruits should be placed in a sieve or some such firm, open structure for immersion in the solution.

The strength of the formalin solution does not deteriorate by use, so that the process of sterilizing batch after batch of fruit can be continued until the solution is practically used up in the process.

For Tropical Fruits.

However valuable the method of fruit preservation described here be in extending the duration of ripe fruit in good condition at home, the greatest benefit, as stated in a previous report on the subject, will be in connection with imported fruit. Many kinds of tropical fruit that, owing to their rapid deterioration and decay, never reach our shores, could be introduced if treated in this manner before shipment. The fact that many tropical fruits decay very quickly in their native country is in reality no argument against the suggestion. It only indicates that in their native countries, as in this and every other land, the surface of every ripe fruit is loaded with the spores of fungi, wild yeasts, &c., which attack the tissues and set up a fermentation that is often mistaken for the normal decay due to over-ripeness. As an example, the state of semi-decay in which bunches of bananas so freqnently reach us as in most instances entirely due to the attacks of various superficial organisms capable of inducing fermentation. This could be prevented by the adoption at the port of shipment of the treatment recommended above.—*Journal of the Board of Agriculture*, Vol. XIII., No. 9.

LIVE STOCK.

DOMESTIC INSECTS : COCKROACHES.

(*Blattidae.*)

If we were to judge from their habits, cockroaches are very plebeian, for the domestic species live in cellars and underground rooms, where there is a certain amount of warmth, coming out at night to feed upon any exposed food,—poor relations of the kitchen and the pantry. Yet if we go back and look up the ancestry of the cockroach we find he can trace his descent from primeval ancestors who hunted through the forests of the Carboniferous Ages ; and so persistent is the type that the fossil cockroaches of the Palaeozoic rocks of North America, described by Scudder, differ very little in general from the insects of to-day. Therefore, in point of ancestry, he is quite a blue-blooded aristocrat, even if he has given up the freedom and dangers of a forest life for the humdrum life of the kitchen. These insects have from a very early date been associated with the habitations of man, and are even found in the temporary shelters of the most primitive. When exploring on the Fly River, in New Guinea, the writer often examined the many bags of food and im plements which the natives (acting on a system of true free-trade) stored away in their large canoes, and frequently found every bag containing thousands of brown cockroaches, often more cockroaches than any thing else. (*Epilampra* sp.)

The cockroaches belong to the great order *Orthoptera*, which comprise grass-hoppers, locusts, and crickets, and have the same kind of biting and chewing mouth of the vegetable feeders ; but under altered conditions they are omnivorous in their tastes, and will eat almost anything, and are carnivorous or even cannibalistic when it comes to a case of hard times. A deep smooth earthenware jar, with some potato-peelings or other food, placed in a convenient place for the insect to drop into will often form a real death-trap, and, on examination a few weeks later, will show a mass of hard legs and wing-covers, the remains of the captives that have been devoured by their imprisoned comrades.

The insect collector will often find that cockroaches, particularly in the tropics, will play sad havoc with his dead specimens if left anywhere within their reach ; but they cannot, I think, be called carnivorous insects in the true sense of the word,—though Tepper considers, from observations he made in South Australia, that they eat plant-eating ground larvae.

While there are a few cosmopolitan cockroaches that by the agency of ships have spread all over the world and become domesticated both at home and abroad, the majority are forest-hunting insects, living under logs and stones, or hiding under dead bark on the trunks of trees. They are most abundant in the warm, moist tropical countries ; yet a species is said to occur at times in such quantities in the huts of the Laplanders as to damage large quantities of their stores of dried fish. It is stated on good authority that they cannot stand prolonged or excessive cold, and Hubbard records that in the severe winter of 1894, when the orange groves of Florida were greatly damaged, all the roaches, except a few in the more substantially built houses, were killed.

The typical cockroach is wonderfully adapted in form and structure for the life it leads ; the whole body is enclosed in a stout, oval, flattened or convex case like the shell of a tortoise, but composed of many transverse plates fitting close together, those upon the back forming a more solid plate of thick chiton than those on the under surface. The head is furnished with long slender antennae composed

of an immense number of short annular segments, and two large eyes just projecting in front of the rounded shield of the front of the thorax, which is turned downward and hidden from above, while the stout spiny legs well adapted for running project on the sides. Those possessing wings, however, are usually more elongate in form ; the stout, oval, flattened fore-wings or elytra, traversed with a network of simple but stout nervures, are laid flat over the flying fan-shaped hind wings which rest in a double fold on the back. The female has a very curious habit of producing her eggs in a horny capsule, which she often carries about with her for some days projecting from the tip of the abdomen, before she deposits it in some suitable crevice in the floor or wall in the house or attached to a twig, or under a log in the forest. The baby cockroaches are pale-coloured little creatures that undergo a number of moults, and, compared with other insects, take a long time to reach the adult state, when from the final moult emerges the perfect insect. Even in the warmer climates Marlatt considers that they only produce one generation in a year, and says, "The abundance of roaches is therefore apparently not accounted for so much by their rapidity of multiplication as by their unusual ability to preserve themselves from ordinary means of destruction, and by the scarcity of natural enemies." In Australia the chief enemies of the cockroach are the parasitic wasps belonging to the family *Evaniidae*, which deposit their eggs in the egg-capsules of the cockroach, the typical black *Evania princeps* being furnished with a short spine-like ovipositor admirably adapted for puncturing the leathery egg-case. This curious hatchet-bodied wasp in consequence is often found inside the house in Sydney resting on the window-frames, after it has emerged from the capsule in which it has been introduced into the house.

Besides the habit of the cockroaches in running over and devouring stored food, most species have a very objectionable roachy smell, which, when numerous, can be often detected on the food they have passed over. Several large wingless bush species in Australia have the glands containing thin foetid liquid very much developed, and, when disturbed, will stand with the tip of the abdomen turned up, and discharge the fluid which has such a vile smell, that they seem to know they have no need to run away when armed with a regular Chinese stink-pot, which renders them quite safe from the attacks of predaceous insects or hungry birds.

Besides living in the house, cockroaches are very fond of the warm close atmosphere on shipboard, and though they are still numerous on ships at times, it was in the old days of wooden sailing ships that these insects had a good time, and the little tenders and river-boats along the northern coast of Queensland used to be alive with these pests. The old sailors' story about the cockroaches nibbling their toe-nails, so that they never required cutting, seems to be quite borne out by facts, while it reflects credit on the insect's digestive powers. A traveller in South America, Mr. Herbert H. Smith (quoted by Marlatt), says: "At Corumba, on the upper Paraguay, I came across the cockroaches in a new role. In the house where we were staying there were nearly a dozen children, and every one of them had their eye-lashes more or less eaten off by cockroaches, a large brown species, one of the commonest kinds throughout Brazil. The eyelashes were bitten off irregularly, in some places quite close to the lid. Like most Brazilians, these children had very long black eyelashes, and their appearance thus defaced was odd enough. The trouble was confined to the children, I suppose because they are heavy sleepers, and do not disturb the insects at work." Though, as a general rule, these insects have a great distaste to light, and rush off to hide the moment a light is struck, I have, in North Queensland, often seen the walls of country stores and publichouses so thickly covered with a small brown species (common all over the north) that at night time one could hardly put his finger upon the wall without touching one, and the dim light of the kerosene lamp did not appear to interfere with them in the least.

On the sugar plantations, in the rough wooden buildings known as the "bachelors' quarters," where the overseers lived, it was quite a common thing to see a row of large green tree-frogs sitting along the wall-plate, or a more friendly one sleeping on the washstand; they were encouraged by the men, who looked upon them as pets, from the fact that at night time they hunted all over the place catching and devouring the large brown cockroaches. In the Flinders River country a small Gecko lizard used to live in the walls of the men's hut, and hunt cockroaches upon the roof at night in a similar manner, but they were not so smart as the coastal tree-frogs.

Australia is rich in indigenous cockroaches, and in Kirby's "Synonymic Catalogue of Orthoptera," vol. I, 1904, published by the British Museum, 217 species are listed from Australia and Tasmania.

REMEDIES AND METHODS OF DEALING WITH COCKROACHES IN THE HOUSE.

In ordinary cases, the different methods of poisoning are to be recommended. Smith, in his "Economic Entomology," says that he has found equal parts of powdered chocolate and borax, ground up thoroughly in a mortar, so that it is well mixed, and placed in their runs, very effective in getting rid of the cock roaches. Other writers advise the use of phosphorous paste, which is simply sweetened flour paste, containing 2 per cent. of phosphorous; this is spread on bits of wood or cardboard and placed in all the sheltered corners where the roaches congregate. During the last outbreak of plague, this mixture was distributed all over Sydney as rat poison, but I believe it killed an immense number of large American cockroaches wherever it was placed under the floors or cellars.

Borax with many different forms of food is used, but Mr. Tepper has recommended another method of inducing roaches to commit suicide. He first places a saucer containing one part of plaster of Paris to four of flour, well mixed, and close to it a saucer full of water, with a few sticks resting against the saucers, so that they can easily get to the food and water. The roach becomes thirsty after flour and plaster diet, and goes for the water, with the result that he gets small bricks in his inside that kill him.

An earthernware crock containing a few inches of stale beer, for which cockroaches have a great liking, and then a few handy sticks resting against the jar, so that they can climb up to get at the fluid, will often destroy great numbers

The most successful method, where a large place is infested, is fumigation with hydrocyanic acid gas, which, if properly applied, penetrates into every corner, and suffocates big and little, most of them coming out of their hiding places and dying on the floor, where they can be swept up in the morning and burnt, as where the fumigation has been weak, it is sometimes found that the roaches revive. For such fumigation, 1 lb. cyanide of potassium to a pint of sulphuric acid and three pints of water will generate enough gas to poison 1,000 cubic feet of space. Bisulphide of carbon is sometimes used, but hydrocyanic acid gas has several advantages: First, it is not inflammable; secondly, it rises up on all sides, and is very volatile, while bisulphide, being a heavy gas, sinks down, and if not used in sufficient strength, will leave a stratum of unpoisoned air just where it is wanted most; and, lastly, the vile smell of bisulphide will hang round for some time after the room has been opened out, while hydrocyanic acid gas soon mixes with the air, and leaves no smell of any consequence behind. Riley considers that burning pyrethrum, or insect powder, will paralyse them, and even when it is simply scattered about on the shelves or corners, or puffed into cracks and crevices, will soon clear them out; but its virtue is but temporary, and it not only makes a mess on shelves and cupboards, but is an expensive remedy in large premises. Paris green is another very good thing to drive cockroaches away. It is scattered about or puffed into

the corners where they hide, and is a more lasting poison than pyrethrum, but from its poisonous nature should be used with care and not left exposed. At the back of book-shelves and presses it is one of the best for roaches, silver-fish, and other insects of this class.

Burning black gunpowder in the infested kitchens is practised in Germany. The powder is damped and made up into little cones, "spitting jennies" we used to call them as boys. The fumes soon bring out the cockroaches, when they can be swept up and destroyed.

Mr. T. A. Janvers, writing in *Scribner's Magazine*, March, 1889, on "Mexican Superstitions and Folk Lore," says that the following is a formula practised by the Mexican villagers to get rid of cockroaches:—"Catch three and put them into a bottle, and so carry them to where two roads cross. Here hold the bottle upside down, and, as they fall out, repeat aloud three *credos*. Then all the cockroaches in the house from which these three come will go away."

HOW TO GET RID OF COCKROACHES.

In answer to a correspondent, Mr. W. W. Froggatt, Entomologist to the Department of Agriculture, supplies the following note:—

An article dealing with cockroaches appears in this issue of the *Gazette*. Among the remedies used in the ordinary house where the run or hiding places o the pests are located, is to puff in Paris green. An excellent bait is powdered chocolate and borax, equal parts; grind it up in a mortar, so that it is thoroughly mixed ; dust this into their hiding-places or place in bunches here and there, covering up all food at the same time.—*Agricultural Gazette of N. S. Wales.*

MISCELLANEOUS.

THE AGRICULTURAL ORGANISATION SOCIETY.

The systematic promotion of agricultural co-operative societies in Great Britain dates from the formation in 1900 of the British Agricultural Organisation Society. Prior to this date a few societies had been independently formed in different parts of the country, but it was evident that there was an opening in Great Britain for a society on the same lines as the Irish Agricultural Organisation Society founded by Sir Horace Plunkett. In 1901 an amalgamation was effected between the British Agricultural Organisation Society and the National Agricultural Union, the new society being known as the Agricultural Organisation Society. In the Society's report for the period ending June, 1906, the following figures are given, showing the progress which has been made in the five years of the Society's existence since April, 1901 :—

	1901.		1905.
Societies existing	12	...	134*
Number of counties in which they are affiliated societies	4	...	41*
Total membership of affiliated societies...	517	...	7,439
Total turn-over of affiliated societies ...	£9,467	...	£221,524

The 134 societies which were in existence in June, 1906, were made up of 96 societies for the supply of requirements or sale of produce; 12 dairy societies; 11 credit societies; 4 allotment societies; 3 motor service societies, and 8 miscellaneous societies. Some of the societies, however, engage in more than one kind of business, and might be classified under several of these headings.

Two central societies, off-shoots of the Agricultural Organisation Society, have recently been formed, one being a trading federation of agricultural co-operative societies and the other a central credit bank. The Agricultural Co-operative Federation, Limited, which was found in 1905, took over the work previously carried on by the Advisory Business Department, and now has fifty-three societies federated to it. It is a trading body purchasing goods on commission on behalf of its societies, and is, therefore, naturally in a much stronger position to make terms with wholesale firms than any single society would be. This has already been indicated by the further concessions which have been granted to it by various firms, and also by the fact that dealers are now offering far better terms to the societies than they did prior to the existence of the Federation. Manufacturers also are, it is stated, finding it to their advantage to deal with societies through the Federation.

The Central Co-operative Agricultural Bank, Limited, which has been in course of formation during 1906, will, it is hoped, remove the chief difficulty encountered in the formation of agricultural credit societies, viz., the difficulty of obtaining capital, and that consequently the number of such societies will increase more rapidly than has hitherto been the case.

Another off-shoot from the Agricultural Organisation Society is the Scottish Agricultural Organisation Society, which was formed in the course of 1905. Owing principally to the difficulty and expense of sending organisers to places at a great distance from London very little progress had up to that time been made in forming societies in Scotland, and it was to carry on this work that a propagandist society on similar lines was formed in that country. An arrangement has been made whereby the Farmer's Supply Association of Scotland can act as the trading federation of local agricultural co-operative societies formed in Scotland.

*June, 1906.

The report shows that the work of the Agricultural Organisation Society continues to make satisfactory progress, but an appeal is made for additional funds in order to enable an extension in directions which at present have to be almost entirely neglected.

In the second portion of the report an account is given of the work of the affiliated societies. Among new developments, mention may be made of the successful introduction of the co-operative sale of live stock by the Winchcombe Co-operative Auction Mart, which commenced business in February, 1905. The Mart has proved a complete and striking success. During 1905 eleven sales were held, at which 1,074 beasts, 3,084 sheep, and 1,363 pigs were disposed of, the total amount realised being £17,459, the prices throughout comparing favourably with the prices ruling in other markets in the country. The receipts from commissions, &c., amounted to £251 1s. 11d., and the expenses to £89 2s. 5d.

The paid-up share capital of the Society was £975. Land was acquired and a market constructed at a total cost of £1,427, the Society raising a mortgage of £400 upon the land. After paying interest on the mortgage and share capital and other charges the Society made a net profit of £100 19s., the greater portion of which was distributed amongst the members as a bonus upon their sales through the Society. A scheme is on foot for the establishment of a similar co-operative auction market at Winchester.

Another form of co-operation which might be taken up by agricultural co-operative societies is its application to the improvement of live stock. Very few societies have as yet done anything in this direction. The Buckingham Agricultural Trading Association has made an arrangement with the owner of a Shire stallion, whereby the horse shall be at the service of any member for his mares, at £1 5s. per mare, instead of the usual fee of £2 2s. All such mares are booked and paid for by the Association, which collects the service fees from the members, deducting a commission of 2½ per cent. for doing so.

The Lledrod Agricultural Society, Cardiganshire, has adopted a different system. The Society has not, as a society, undertaken the improvement of stock, but groups of eight, ten or twelve members have been formed to purchase bulls. A service fee of 1s. is charged to those who shared in the cost of the bull; to others a charge of 2s. 6d. is made. When the bull is sold, each of the contributing members receives back what he paid, and if there is any profit, it is handed over to the member by whom the bull was kept.

Several co-operative allotment societies have been formed which hire land direct and let it out to their members.—*Journal of the Board of Agriculture.*

SCHOOL GARDENS AND THEIR WORK.

Many and varied are the branches of instruction undertaken by the various committees charged with the administration of technical education up and down the country, but we doubt if any subject taught is of greater, or even of equal utilitarian value, to that of gardening. At the end of the session the students have something tangible to see as the result of their labour and instruction. No one will deny that good work has been done in fostering a love of the craft among cottagers and allottment-holders, for one has only to visit a show such as we recently attended to see the extraordinary produce of fruits, flowers, and vegetables, from allottment grounds. Similar instruction is now being, in many cases, extended to the elder boys in the village schools, and the establishment of school-gardens, such as we warmly advocated many years ago, but at the time with little effect, is now rapidly developing. One of the most active counties in this direction is Hertford-

shire, whose Agricultural Education Sub-Committee has done much to advance this important subject, and in various places in the county are established school-gardens for boys between the ages of eleven and fourteen years attending the elementary schools; and also plots for older lads who are attending evening schools. The scheme is supervised by a staff lecturer, Mr. A. E. Burgess (formerly connected with the Essex County School of Horticulture), and he is assisted by several sub-instructors. In order to help forward the work special classes in horticulture and botany are established for school-teachers (many of whom, it is well known, are first-rate cultivators), so that they themselves may lend a hand in the work of instruction. The rapid increase in the work, however, has made the appointment of an additional instructor necessary, and during the present year, Mr. J. H. Walker, of Leicester, has been appointed to the western side of the county, where he has already several school gardens at work. In all the centres the boys have separate plots and the county provides tools, tool-houses, and sometimes seeds. The boys are, subject to certain restrictions, allowed to appropriate the produce of their individual plots.

One of the most important centres of the work is Cheshunt, where it was our pleasure recently to inspect the gardens, and to see the boys at work. The local Council of Cheshunt has acquired a large house and grounds—the Old Manor House—for Urban district offices, etc., and the garden afforded an ideal spot for the scheme. About one acre of this garden is rented by the Technical authorities, and it has been stocked with trees and flowers, largely through the generosity of Mr. George Paul, who takes a keen interest in the movement. Four schools take part in the work of this garden, and the number of boys attending each week is over one hundred. Each lad receives one and a half hour's instruction, somewhat as follows:—Three-quarters of an hour in the Technical School attached to the garden, where he is taught the principles of horticulture, and three-quarters of an hour practical work and instruction in the garden. The garden is divided into several sections, viz., (*a*) General plot, consisting of flower-borders and fruit and vegetable quarters. Here the lad receives a preliminary training before being apportioned a plot to himself; (*b*) school plots; there are four of these, and each is divided into fourteen small plots, one for each boy. For the school with the best quarter is offered a Challenge Shield, presented by the nurserymen of Cheshunt. It has been won this year by the Cheshunt British School, (*c*) beds for the inclusion of plants of the more common families; (*d*) an orchard-plot, containing Apple, Pear, Plum, Medlar, Quince, and Cherry trees. These trees have been trained in various ways. More than fifty have been grafted or budded, either by the students themselves, or by the instructor for demonstration purposes. The boys can thus watch the development of a tree from the bud or graft to its final shape. The seeds are provided by the local Education Sub-Committee. The vegetables, fruit, etc., from the general plot are sold, a goodly portioned being purchased by the parents of the lads attending the class. The produce of the four school gardens is, as stated, taken by the boys themselves, subject to the payment of a small sum, and they may dispose of it as they wish. No lad, however, is allowed to remove anything before it has been valued by the instructor and entered in a note-book. Thus, the boys are taught the value of a crop as well as the manner of producing it. The fifty-six plots were each carrying the same crops—Beans, Lettuce, Potatos, Carrots, Beet, Onions, and Parsnips. A crop of Peas has just been harvested, and the boys had made more than sufficient from the sale of these than the amount of their fees. The size of each plot is about thirty square yards, although in some of the centres they are from thirty-six to forty square yards. In bad weather the lads assemble in the potting-shed, where they are given suitable work.

The gardens are also used for demonstrations to the public and to the pupils of the evening classes. Cheshunt and district should be congratulated on having in their midst such a man as Mr. George Paul, to whose energy and influence the establishment of technical horticulture in the district is largely due, and through whose generosity many acceptable plants and trees have been added to the garden. —*Gardeners' Chronicle.*

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THE INTERNATIONAL AGRICULTURAL INSTITUTE.

The International Agricultural Institute owes its inception to the initiative of His Majesty the King of Italy, who early in 1905 invited the different Governments of the world to take part in a Conference, to be held at Rome in the May following, for the purpose of considering the constitution and organization of the proposed Institute. The objects which the King of Italy had in view in suggesting the creation of this new body may be gathered from the following extract from a letter which His Majesty addressed to the President of the Italian Council of Ministers:—

"The agricultural classes, who are generally the most numerous, and who exercise great influence everywhere on the fate of nations, are unable, owing to the area over which they are scattered, to take adequate measures either for the improvement of their produce and for its distribution in accordance with the demands of the consumers, or for the protection of their own interests in the market, which is becoming more and more world-wide, for the more important products of the soil.

"In these circumstances an International Bureau would be of the greatest assistance; a Bureau, which, devoid of any political object, would aim at studying the conditions of agriculture in the various countries of the world, and would notify periodically the quantity and the quality of the crops, in such a way that production would be aided, transport rendered cheaper and quicker, and a more convenient basis established for the determination of prices. This Bureau, acting in accordance with the various departments of State concerned with agriculture, would also furnish precise information on the condition of the labour market in different places, so that emigrants would have a useful and reliable guide; would promote agreements for the common protection against those diseases of plants and cattle which measures undertaken locally are unable to cope with successfully; and in the last place would encourage, when the opportunity offered, the development of rural co-operation, assurance, and agricultural credit.

"The beneficial effects of a Bureau of this kind, which, as a bond of solidarity between all agriculturists, would be a weighty element in favour of peace, would be far-reaching. Rome would be a worthy seat for the Bureau, where the representatives of the adherent States and of the principal agricultural associations would meet, and harmonize the authority of the Government with the free energy of the cultivator of the soil."

The Conference for the further consideration of the proposal was formally opened at Rome on the 20th of May, 1905, forty different States being represented. The following gentlemen acted as delegates of Great Britain, viz:—His Excellency the Right Hon. Sir E. Egerton, G.C.M.G., K.C.B.; the Right Hon. the Earl of Jersey, G.C.B., G.C.M.G.; the Right Hon. the Earl of Minto, G.C.M.G.; Sir Thomas Elliott, K.C.B.; T. P. Gill, Esq., while Sir Edward Buck, K.C.S.I., represented the interests of the Government of India.

The programme of matters to be considered by the Conference comprised:—

(1) Constitution and organization of the International Institute of Agriculture.

(2) Functions of the Institute.

(*a*) To notify periodically information concerning agricultural produce, conditions of labour, disease of plants and cattle.

(*b*) To facilitate from the international point of view the organization and movement of rural co-operation, insurance, and agricultural credit.

(*c*) To propose, on its own initiative or on the invitation of Governments, international measures and institutions for the protection of the interests common to the agriculturists of all countries, taking into consideration also the views expressed by the International Congress of Agriculture.

(*d*) To exercise the other functions which already form the object of the large agricultural associations, and with which the Institute could deal independently of the action of different Governments.

(3) Financial resources of the Institute.

These subjects were discussed and reported upon by committees and sub-committees of the delegates, and their conclusions were embodied in an "Acte Final," which it was arranged should be submitted by the Italian Government for the consideration of the various Powers.

According to this document the International Agricultural Institute is to be an official institution, in which each country adhering shall be represented by delegates of its own selection.

Whilst limiting its action to international questions it is to be the duty of the Institute:—

(*a*) To collect, elaborate, and publish, with as little delay as possible, statistical, technical, or economic information regarding the cultivation of the soil, its production, whether animal or vegetable, the trade in agricultural products, and the prices obtained on the various markets.

(*b*) To send to interested parties, in a similarly rapid manner full information of the nature above-mentioned.

(*c*) To indicate the wages of rural labour.

(*d*) To notify all new diseases of plants which may appear in any part of the world, indicating the districts affected, the spread of the disease, and, if possible, the efficacious means of resistance.

(*e*) To consider questions relating to agricultural co-operation, insurance, and credit, in all their forms, collecting and publishing information which may be useful in the various countries for the organization of undertakings relating to agricultural co-operation, insurance, and credit.

(*f*) To present, if expedient, to the Governments, for their approval, measures for the protection of the common interests of agriculturists and for the improvement of their condition after having previously taken every means of obtaining the necessary information, *e.g.*, resolutions passed by International Congrsses or other Congresses relating to agriculture or to science applied to Agriculture, Agricultural Societies, Academies, Learned Societies, &c.

All questions relating to the economic interests, the legislation and administration of any particular State are to be excluded from the sphere of the Institute.

The States adhering to the Institute will be classified into five groups, according to the place which each State considers best to select.

The number of votes at the disposal of each State, and the number of units of subscription, are fixed according to a scale by which the units of subscription may vary from one to sixteen and the votes from one to five. In any case the contribution corresponding to each unit of subscription can never exceed the sum of 2,500 francs (£100). As a temporary measure, the subscription for the first two years will not exceed the sum of 1,500 francs (£60) for each unit.

In order to assist by his personal help towards the foundation and maintenance of the Institute, His Majesty the King of Italy was pleased to present to the Institute the control and the revenues of two domains in the environs of Pisa, estimated to produce an annual income of some 300,000 francs (£12,000). Pending the legal constitution of the Institute, this magnificent benefaction has been assigned to a Royal Commission as from the 1st of July, 1905, and it has been decided to devote the income accruing from that date to the construction of a house to form the seat of the Institute.

The new building, which will be constructed in the grounds of the Villa Umberto I., in the neighbourhood of the Pincian Gate, on an area of 10,000 square metres of State property, will in all probability be completed towards the end of 1907.

The British delegates, in their report on the proceedings of the Conference, after describing the steps which led up to the conclusions embodied in the "Acte Final," make the following general observations on the purposes which it is hoped the International Institute will not unworthily fulfill :—

"It will be apparent from a perusal of the 'Acte Final' of the Conference that the proposed Institute will in effect constitute an International Agricultural Intelligence Department for the collection, collation and publication of technical, economic, and statistical information of interest to agriculturists, special prominence being given to the questions of co-operation, insurance and credit. It is true that provision is also made for the submission to the various Governments of

proposals for the protection of interests common to agriculturists, and for the improvement of their condition; but in view of the stipulation that questions touching the economic interests, the legislation and the administration of individual States shall be specifically excluded from the competence of the Institute, and that the subjects to be discussed by the General Assembly of the Institute are to be such as are approved by the adhering Governments, it would appear that the difficulties and dangers which might attend the extension of the work of the Institute in this direction are sufficiently guarded against.

"Several of the leading agricultural departments already endeavour, so far as is practicable, to collect and publish information as to the agricultural production, prices and the wages in the countries of the world, and the value of such information is universally recognised. The extent to which it is obtained, the methods of collection and of publication, differ, however, very materially, and it may be expected that the establishment of the Institute will lead to a considerable extension of the area from which full information is obtained and to greater uniformity as regards the manner of its collection and presentation.

"It was fully recognised that the utmost promptitude must be secured if information of the character in question is to realize its full value, and that free use must be made of telegraphic agencies for this purpose.

"The Institute will, moreover, afford to agricultural departments to the various agricultural societies, and to private individuals alike, a much more ready means of obtaining information as to comparative agricultural conditions in a form which will enable it to be safely and conveniently used than is at present available. The difficulties attending the use of technical and statistical information, given in foreign official publications, or obtained as the result of special inquiry, are well known, and it will be of distinct advantage that an international body should be available for reference, charged with the duty of sifting and collating such information for the assistance of those concerned.

"The publications of the Bureau should become invaluable to students and writers on agricultural subjects and to the officers of the various agricultural departments and societies. Those officers, with the assistance of agricultural newspapers and of the Press generally, may be trusted so to utilize and make known the work of the Institute as to render it of the greatest possible practical value to the cultivator.

"The expenditure of the Institute will to a material extent be met out of the resources so graciously placed at its disposal by His Majesty the King of Italy. The balance of the charge remaining to be borne by the various adhering powers will be comparatively small, especially if the proposals receive the unanimous support of the States represented at the Conference, and if those States take a liberal view of their requirements as regards the choice of the group in which they will be proposed to be included. The maximum expenditure of a State adhering to the Institute as a member of Group I. will be, as we have already stated £960 during each of the first two years of its existence, and £1,600 subsequently. We have no hesitation in expressing the hope that the necessary provision will be made to enable the United Kingdom to take its share in the work of the Institute, and we believe the resulting benefits will be fully commensurate with the outlay proposed."

The Lords Commissioners of His Majesty's Treasury have agreed to the adherence of this country to the Convention for the Establishment of the Institute, and the Signature of His Majesty's representative at Rome was accordingly affixed on the 27th February, 1906.

The Correspondence on the subject, together with the Report of the British delegates and the Minutes of the Proceedings at the International Coference, have been published as a Parliamentary Paper. (Cd. 2958. Price 1s. 7d.).—*Journal of the Board of Agriculture.* Vol. XIII., No. 3, June, 1906, pp. 129-134.

CO-OPERATIVE CREDIT SOCIETIES ACT.

According to the United Provinces Report on the working of the Co-operative Credit Societies Act for the year 1905-06, the number of these Societies has increased at a remarkable pace. In the previous year there were only 223 Societies, many of which were said to be in a moribund condition. This year's returns, however, show that before the end of March, 1906, 358 societies had been registered, and the assets dealt with amounted to Rs. 201,073, as against Rs. 75,603 in the preceding year. With regard to the total amount of the reserve we are left in the dark; but it is stated in the Report that during the year amounts aggregating Rs. 2,307 were transferred to the reserve fund. The steady growth of this fund is, as the Chief Secretary to the Government of the United Provinces points out, of the greatest importance, and the natural inclination of the management to include profits in their working capital instead of transferring them to the reserve must be resisted. Meanwhile, it is satisfactory to note that the excess of assets over the liabilities has reached the figure of Rs. 15,429; and, although this does not all represent profit on working—for it includes the entrance fees to the amount of over Rs. 4000—it is a substantial sum considering how short a time many of the societies have been in existence. Another encouraging sign is that central or district banks have now been started in thirteen districts, and that there are village banks in nineteen other districts. The experience of the past year suggests that development in the future will be mainly on the lines of the central or district banks, with affiliated societies gradually spreading as branches or agencies throughout the locality served by the central bank. Compared with other forms of societies, the central attracts more capital, as it affords greater security. It also offers a solution of the difficulty of keeping proper accounts, which has been experienced by so many village banks, and its operations can be more easily supervised by the Registrar and his inspectors. It is, further, very satisfactory that in the case of several societies—the Report mentions five central banks with 154 affiliated societies—the members have agreed as a condition of their membership, to compulsory deposits depending either on the rent they pay to the landholder or on the number of ploughs they own, payable at harvest time. This will not only in time add largely to the capital available, but will give each member a personal interest in the prosperity of the bank and will induce him to keep a watch over its operations. So far, the most important institution, from the point of view of the extensions of its transactions, is the Moradabad district bank. Temporary and limited though it is, the guarantee offered by the Government has given confidence to the people, and there seems little prospect of any call being made on Government for assistance in paying the annual dividend. It already has a reserve fund of nearly Rs. 600, and shows a balance of assets over liabilities of Rs. 1,550. More capital will be required. but it seems probable that there will be no difficulty in obtaining this locally. The Benares society of silk-weavers is also a very promising institution, but it will have far greater difficulties to contend with than an ordinary agricultural society. Of the smaller institutions the Bargarh central bank in the Banda district is especially worthy of note. Altogether, the Report shows that considerable progress has been made during the year, that the value of joint responsibility and co-operation is appreciated, and that the security thereby afforded will attract capital at moderate rates of interest. When the system has attained a higher degree of development, then it may reasonably be hoped that the lot of the peasant will receive permanent improvement.—*The Indian Agriculturist*, Oct. 1, 1906.

CO-OPERATIVE CREDIT AMONG INDIAN RYOTS.

Among other evidences of the enlightened spirit which is now being awakened in the development of India's greatest industry are the existence and character of the Agricultural Journal of India, published from the Pusa Research Institute. The second quarterly number is in every way an improvement on the first, and there are several articles in it which will command the greatest interest in every part of the country. It is not a little instructive to notice what a very large number of writers on Indian agriculture have reached the general conclusion that the greatest problem of agricultural improvement is the provision of capital for the financing of the cultivators throughout the land. "The remedies," observes Mr. Sly in a note at the end of the Journal, suggested for the existing want of capital are many and varied. One suggests that Government should, as an experiment, clear off all cultivators' debts in a selected tract; another proposes bankruptcy proceedings on the model of the 'conciliation' methods of the Central Provinces; a third alternative is a joint-stock bank with a Government guarantee and other privileges; whilst the majority believes that salvation lies in Co-operative credit." This being the opinion of the majority, the article on "Co-operative Credit in the United Provinces," by Mr. J. Hope Simpson, which is published in the same number of the Journal, will be read with exceptional interest. No one knows the subject better than Mr. Simpson; in no other province have experiments in co-operative methods been so extensively carried out; and in no other part of India, therefore, have the results so great a value. The first conclusion set out by Mr. Simpson is that village banks on the German or Raffeisen model, which were very widely instituted in 1901, have been, speaking generally, a failure. Only one-third of those established have survived as working bodies, the rest being either dead or moribund. What it may be asked is the reason of this failure? Is the principle of co-operative banking discredited, or merely the methods by which it was sought to institute it? We are glad to see that Mr. Simpson, though an official himself, is quite ready to acknowledge that one of the principal causes of the failure has been the excessive official patronage extended to the experiment. He writes:—"The inception of the co-operative movement in the Provinces lay not with the people, but with the Government, and the formation of village banks was a direct consequence of Government orders. Neither the officials nor the landlords by whose action the banks were opened, nor the members of whom they were composed had any intimate knowledge of any practical experience of the principles of co-operative effort. It is a first essential to the success of co-operation that the members of a society should act voluntarily, and that each member should have confidence in the rectitude and honesty of those with whom he associates and for whose debts he takes upon himself the responsibility. At the outset of the movement there was in most cases no question of voluntary membership. Cultivators became members, not with any intention of contributing to a joint fund and enjoying the benefits which such a fund would confer,—not with any idea of combination in order to obtain credit at more favourable rates than are usually granted to the individual cultivator,—but partly on account of pressure brought to bear by the official or the landlord, and partly in the hope that, in virtue of the payment of a four-anna entrance fee, each member would be entitled to unlimited credit at a favourable rate of interest." But this has not been the only cause of failure. The complexity of rules and accounts imposed upon the village co-operators ruined a large number of otherwise promising societies, and the not unnatural reluctance of capitalists to put their money into institutions with so little appearance of soundness or permanence has prevented in a large measure any effectual competition with the usurious bunia. None of the causes of failure, however, has been more serious than the difficulty arising out of caste differences. On this point Mr. Simpson remarks:—"Of the burdens and hardships entailed by

the caste system there can be no doubt; nor is it disputed that the tendency of that system is, as a rule, hostile to progress and reform. Its existence and its power are, however, a very distinct indication of a method of extension of co-operative effort along the line of least resistance. If members of caste of widely varying social status are enlisted in the ranks of the same society, it is clear that the whole force of the caste system is arrayed against successful effort. It is impossible to believe that a Braham will become jointly responsible for the debts of a Chamar, or that the influence of a Dhobi will suffice to induce a Thakur to pay up a loan, when the latter has preferred the smiling path of recusancy. It is also impossible to expect satisfactory combination between two persons, one of whom enters the village meeting house in order to attend a general meeting of the society's members, while the other is bidden to sit in the street below. Where castes of widely varying social standing are enlisted in the same society, it is obvious that equality, which is the mainspring of all co-operative effort, inevitably disappears, and that success cannot result." Obstacles are, or should be, only stepping-stones to success, and it is evidently in this light that they are considered by the authorities in the United Provinces. Difficulties of caste are now being got rid of by the provision of banks containing only members of one caste. Their consequent smallness and the illiteracy of the members are neutralised by their affiliation to a central district bank. The same devise gets rid of complicated accounts for every society; it also gives the necessary confidence which attracts capital, and money for investment is beginning to flow into the movement in a satisfactory manner. Still there are lions in the way. The granting of money for unremunerative undertakings—as, for example, for marriages—is one; the capacity of a caste punchayat to bear financial responsibility is hardly yet proved; while a third difficulty is the dread of any officially-feathered scheme. We are glad, therefore, to see that Mr. Simpson is alive to the fact that the success of the movement depends upon its assuming a popular and non-official character. Here and here only lies the keystone of success, and we are in full accord with Mr. Simpson's concluding paragraph, in which he says:—"Once co-operation in any form is a success the people may be trusted to work out other forms for themselves. The agriculturist of these Provinces has never shown himself slow to adopt any improvement which is workable and valuable, and it is not to be expected that he will be slow to adopt the principles of co-operation, once they are proved by experiment to be successful in any one direction. That these principles are sound is undoubted and their ultimate general adoption is simply a matter of time and of careful and systematic education. The methods best suited to the conditions of the country will be ascertained by the people for whose benefit the present attempt is being made. And once the principles are known and the method of their application ascertained, a new era will be drawn for the agriculturist and for the lower classes generally."—*Indian Agriculturist.*

Correspondence.

MULCH AND CAPILLARITY.

SIR,—The true signification of the word mulch is, strange to say, not understood by many practical agriculturists, and even "The Times" does not seem to be quite clear on the subject, to judge from the extract given by Mr. Biddulph on page 510 of the "*T.A.*" for December last. In this passage there are one or two statements to which I would take exception.

1. "Very roughly speaking it (mulching) is that light caking of surface soil which protects the soil beneath." Now the caking of the surface soil is just that condition which favours surface evaporation and makes a mulch necessary, and the easiest way this is prevented is by *breaking up* the surface soil and leaving a loose superficial layer. It is by the "settling down" of the topmost layer that the "capillary tubes" are brought to the surface, and loss of water occurs by evaporation.

2. "To mulch is to beat stuff together into a compost without binding it." This, to say the least, is an extraordinary definition, and no one is likely to learn how to take advantage of the process of mulching by reading it. I would say that to mulch is to provide a surface covering consisting of some transported materials, such as straw, decayed leaves, coir dust, &c., or of a loose dressing of soil provided *in situ* by frequent stirring of the topmost layer.

The question raised by Mr. Biddulph as to the nature of capillary tubes is answered in a few words. "Capillary tubes," *per se*, are tubes (of any material) of such calibre (comparable in fineness to that of a hair-*capilla*) as gives them the property of capillary attraction for fluids such as water, *i.e.*, the property of "sucking up" water when brought in contact with them. Inversely, water in contact with such tubes rises up by capillary attraction. These must be accepted as physical facts which call for no explanation here.—Now, when soils are in the best mechanical condition, neither too loose not too dense, they provide the best condition for the formation of capillary tubes which, however, are not of typical structure, *i.e.*, straight and uniform, but are passages formed (as the Editor of the "*T. A.*" pointed out) by a series of the interspaces between soil particles, and offering the same conditions for water attraction as typical capillary tubes provide.

Yours truly,

C. DRIEBERG.

Colombo, 14th March, 1907.

Minutes of the Board of Agriculture.

The Thirtieth Meeting of the Board of Agriculture was held at the Council Chamber at noon on Monday, the 8th April, 1907.

His Excellency the Governor presided.

The others present were :—The Hon. Mr. W. H. Brodhurst, the Hon. Mr. C. T. D. Vigors, the Hon. Mr. H. L. Crawford, C.M.G., the Hon. Mr. S. C. Obeyesekere, the Hon. Mr. A. Kanagasabai, the Hon. Mr. J. Ferguson, C.M.G., Dr. J. C. Willis, Messrs. J. Harward, W. D. Gibbon, R. Morison, E. T. Hoole, and C. Drieberg (Secretary).

Visitor :—M. Supparamaniam.

BUSINESS DONE.

1. The Minutes of the Meeting held on March 4th, 1907, were read and confirmed.

2. The Progress Report (No. XXIX) was presented and taken as read.

3. Dr. Willis made a statement regarding the tour through the Southern Province undertaken last month by himself and the Secretary; the full report of which will be available shortly.

4. Reports of the following Branch Societies were tabled:—Wellaboda Pattu (Galle), Vavuniya and Bopagoda.

5. Dr. Willis read a paper on Roadside Arboriculture by Mr. Chas. Stouter, and added his own comments, commending Mr. Stouter's proposals and suggesting that an experiment in tree planting be undertaken at once to test the value of different kinds of trees for roadside planting.

His Excellency the Governor approved of the suggestion of an experiment. The Hon. Mr. Obeyesekere also offered some remarks.

6. A. Statement of Revenue and Expenditure for 1906 was tabled.

6*a*. The consideration of the appointment of an Auditor, approved of by the Finance Committee, was postponed till next meeting.

7. Reports on the Nuwara Eliya Show by the Secretary and the Government Veterinary Surgeon were tabled for information.

Agricultural Society Progress Report. No. .

Membership.—The following members have joined the Society since the last meeting held on the 4th March:—Messrs. Martin M. Smith, L. W. A. de Soysa, J. P. Abraham, W. S. Goonewardene, W. B. de Saram, Alex. L. Kirk, C. D. Sparkes, B. D. S. Abeyaratne, W. Balding; and the following new Branch Society has been affiliated:— Bopagoda Agricultural Association.

Branch Societies.—The *Bopagoda* Branch was formed as a result of a public meeting held on the 20th March, Mr. N. Wickramaratne, Agricultural Instructor being present. He addressed the gathering on the objects and uses of such Societies, and 549 members joined the new Society from the following villages:—Puwakbodaowita, Dehigaspe, Lenpotdeniya, Kotagala, Hattotuwa, Urumutta, Kehelwala Deviture, Welihena, and Dematapassa of the Morawak korale.

The Organizing Vice-President and the Secretary visited the Southern Province, and were on tour from the 21st to the 27th March. The itinerary included Weligama, Telijjawila, Matara, Dampella, Sultanagoda Farm, Talpawila, Galle, Baddegama, Kimbiya, Nagoda, Gangaboda pattu (Galle), Hinidum pattu, Hikkaduwa, Wellaboda pattu (Galle), Weragoda, Kalutara, Panadure, Walana, Lunawa, and Kiriwattuduwa. At suitable centres opportunity was taken of meeting officials of the Branch Societies and conferring with them, and of visiting school gardens where they exist. A full report on the visit and the work done during the tour is presented to the meeting separately.

Under orders from His Excellency the President, the Organizing Vice-President and the Secretary will be visiting the Batticaloa District about the middle of this month.

Pasdum Korale East will start work shortly. The Assistant Government Agent of Kalutara reports in his Diary for February as follows:—"The Mudaliyar of Pasdun Korale East is preparing to start a Branch Association of the Agricultural Society in his division. He proposes to have two experimental gardens, as his division is rather extensive, and to devote a portion of each garden to fruit and the rest to vegetables. There is considerable room for development in market gardening in this district. All kinds of fruit and vegetables suitable to the low country will grow here in profusion."

The *Vavuniya* Branch is conducting a number of experiments in the cultivation of cotton and other crops.

The *Forwarding Agency* under the auspices of this Branch is actively engaged in trying to find a good market for various products. It has already sent black cattle and buffaloes, eggs and limes, yams and nux vomica seed to Colombo. The price realized for nux vomica, Rs. 3·50 per cwt., is considered low, and further inquiries are being made with a view to finding a better market. One indirect benefit resulting from the Agency is that traders buying locally are now forced to offer better prices for cattle, viz., Rs. 20 to 25 per head, instead of Rs. 12 to 18.

The Agency is offering to book oranges in quantities of not less than hundred at Rs. 4 per 100, exclusive of freight.

Mr. A. Y. Daniel, the Colombo auctioneer, writing on the subject of a Central Agency, of which he will act as agent, says:—"*Re* articles available for sale, I mark a scarcity of fruit. This, I think, should command a ready sale, and consignments should be encouraged. I note that the Ambalangoda Branch (Wellaboda pattu) proposes to send flower pots. This, in my opinion, would not be advisable, as the cost of transport will be heavy, besides the risk of breakage. Friday mornings will be suitable days on which sales should be held."

The Kandy Co-operative Agency.—This Agency reports that it is prepared to undertake the sale of every description of agricultural produce, including cattle and poultry, &c.

Spirit made from the Kaju Puhulan.—Professor Dunstan reports as follows on a sample of spirit supplied to the Imperial Institute by the Matale Branch Society :—

"The sample of spirit made from the 'Kaju Poolan,' the succulent fruit stalk (called Cashew Apple) of the Caju-nut. which you forwarded to the Imperial Institute, through Sir Stanley Bois in August last, has been examined here, and I now send the following information regarding it :—

"The sample consisted of 90 cc. of a clear, faintly yellow liquid, having an aromatic taste and odour; its specific gravity was 0·9012.

"The examination showed that the product was a dilute spirit containing 47·2 per cent. of absolute ethyl alcohol, 0·25 per cent. of ethers (calculated as acetic ether), and 0·92 per cent. total acids (calculated as acetic acid). The remaining 52·5 per cent. consisted of water with a very small quantity of dissolved solid matter. It was not possible to detect the presence of higher alcohols owing to the smallness of the sample."

The *Wellaboda Pattu* (*Galle*) has a membership of 160. A resident landowner, in sending a donation of Rs. 315 on behalf of the Show Fund last year, wrote as follows in appreciation of the work undertaken by the Society :—"I am one who has profited by the establishment of the Agricultural Association. I have (being induced by its work) improved a considerable extent of land which was lying waste for a long time." Vegetable growing has become a recreation with some and an industry with others, and the cultivation has been so largely taken up that 57 gardens were allowed by the Committee to compete for the gold medal awarded at the Show last year. The produce of the Experimental Garden is sold weekly, and seed is being distributed free to villagers. The experiment in poultry farming proved a failure and had to be given up. The Society is offering prizes for vegetable gardens —cultivated according to approved methods—to encourage cultivators. At a Meeting of this Society held on the 16th March, the following resolution among others was adopted :—

Resolved—"That with the view of encouraging garden cultivation on approved methods, and also for the purpose of finding occupation and residing grounds for persons having no lands of their own but willing to help themselves, the Government be asked through the Parent Society to set apart about a hundred acres of Crown land, which such persons, on the recommendation of this Association, can occupy and plant on payment of a rent, and on the understanding that the plantations shall not be abandoned without sufficient cause."

Proposed Central Agency in Colombo.—The Special Committee appointed by the Board in January last to consider the desirability of establishing a Central Agency in Colombo, after two sittings, have submitted their report, recommending the employment of an auctioneer as agent. The report is tabled for information of the Board. Circulars have been addressed to the Branch Societies as per recommendations (*b*) and (*c*).

The Committee of Agricultural Experiments, at a Meeting held at the Experiment Station, Peradeniya, on the 7th March, adopted the following resolutions :—

(*a*) "That a return be supplied of all other experiments other than cacao in progress."

(b) "That Members of Committee be supplied with large maps of the Experiment Station clearly showing (in colours, if necessary) the different experiments, and that the plots be properly numbered according to recent survey."

Betel Cultivation: Its Diseases and their Prevention.—Mr. M. H. Mirando, Honorary Secretary of the Negombo Branch Society (and Muhandiram of Alutkuru Korale North) has offered through the Parent Society a gold medal for presentation by His Excellency the Governor for the best written essay on Betel Cultivation in English, Sinhalese, or Tamil, to facilitate the work of a Specialist in making researches and recommending what measures should be taken to eradicate the disease. The essay should treat fully with the cultivation under the heads of soil, method of planting, manure, &c., but specially with the origin and known or suspected causes of the disease and the means taken to combat it.

In reply to enquiries made the Director of Agriculture, Bengal, writes :—"The disease you refer to is not uncommon in Bengal, but no special investigation has been undertaken on the subject in this Province. . . . . The best remedial measure is to remove the affected plants wholesale from your betel leaf gardens."

Mullaittivu Branch.—The programme of work adopted for this year by the Mullaittivu Branch include—(a) The encouragement of school gardens in the district; (b) the holding of a Show to be held on or about Empire Day at Mullaittivu, at which prizes would be offered for tobacco and garden vegetables; (c) forwarding cattle and other produce to Colombo market; (d) experimenting in improved methods of paddy cultivation.

West Indian Yams.—Reports on the cultivation of these are still awaited, but Adigar S. N. W. Hulugalle reports that they are doing very well in the Wanni hatpattu.

Seedlings, Cuttings, &c., for Experimental Purposes.—Mr. K. B. Beddewela of Maligatenne, Kandy, writing on the 2nd April, says :—"I have on hand a large quantity of Malabar pepper cuttings (free from disease), Erythroxylon Coca, seeds and plants (self-sown), loquat plants (self-sown); the former two varieties will be sold at a reduced rate to Members of the Society, and the latter will be exchanged for mangosteen and durian plants."

Bellary Onions.—Applications for Bellary onions, of which a supply of seeds is being imported by the Society, are still being registered. Applications will be received up to end of April. The quantity to be imported is rather limited.

Tobacco: Manuring with Artificial Fertilizers.—With regard to the suggestion made at the last Meeting of the Board, that an experiment be carried out which would afford a basis for estimating the advantages or otherwise of scientific manure on tobacco, satisfactory arrangements have been made for the trial. Mr. Rasanayagam has consented to plant up three plots with tobacco: (a) manured with cattle dung, (b) manured with chemical fertilizers, and (c) unmanured. Each plot will be three acres in extent, and the leaf will be cured separately. Messrs. Freudenberg & Co. have kindly supplied a ton of manure for the experiment, free of cost.

Vegetable Seeds.—Varieties of English vegetable seeds enumerated in the last Progress Report are expected to arrive here by the end of April, when they will be immediately distributed to Members who have applied. Improved varieties of the following will be procured from India :—Bandakka, Bonchi, Chili, Dara-dambala (Princess bean), Kariwila (bitter gourd), Snake gourd, and Vetakolu (luffa).

Agricultural Shows.—It has been decided to hold an Agri-Horticultural Show at *Kegalla* on 28th and 29th June, 1907.

The Mullaittivu Branch proposes to hold a small Show at Mullaittivu on or about Empire Day.

The Show under the auspices of the Telijjawila Branch, which was originally arranged to be held at Weligama on account of its close proximity to the railway station, is now proposed to be held at Telijjawila in the buildings already existing on the Experimental Garden, thereby saving expenses on erecting sheds which would be necessary in the case of Weligama. The money thus saved will be utilized in increasing the number of prizes. The dates of the Show have been changed from 17th and 18th April to 15th and 16th May, 1907; a better exhibit of fruits will be available at the latter date. With regard to the change of *venue*, the Hon. Secretary writes: "Any visitors coming to Telijjawila, which is reached by an excellent metalled road, will not regret the journey, as along the seven miles' drive a good deal of village life is seen. The journey is through some excellent paddy tracts in the korale, and extensive coconut, cinnamon, and citronella lands."

The Market Show at *Trincomalee* was held on the 2nd instant and a report is awaited. Prizes to the value of R150 were given at this Show.

At the Nuwara Eliya Show, which was opened on the 2nd instant by Her Excellency Lady Blake, in the absence of the Governor at Batticaloa, the two best sections were the exotic vegetables and the poultry. The exhibits of flowers, though not so numerous, were of a high standard. Fruits and cattle were comparatively poor. The native products were very fair. It is to be regretted that the inclemency of the weather greatly marred the success of the Show and helped to considerably reduce the attendance.

The Parent Society offered two prizes of Rs. 25 each at this Show, viz., one for the best collection of native vegetables and one for the best collection of paddy grown in the district.

The Shows so far fixed are—

Telijjawila	May 15 and 16
Uva (Badulla)	April 26 and 27
Welimada (Market Fair)	May
Mullaittivu (Market Fair)	Empire Day
Matale	June 21 and 22
Colombo	June
Kegalla	June 28 and 29
Dumbara	August
Katana	November

Examination for Agricultural Instructors.—At the examination held on the 1st December, under the scheme for training Stock Inspectors, &c., in agricultural work, five, out of seven candidates, passed, viz., M. D. S. Wijeyanayake, N. Wickremaratne, B. D. Stephen, A. M. Fernando, and L. A. D. Silva.

Publications.—The Editor of the *Sihala Samaya* having as usual forwarded copies of his paper containing translations of the Proceedings of the last Meeting of the Board, these were distributed among the Branch Societies.

An Agricultural Calendar, in Sinhalese, is in the hands of the Government Printer, and will be issued shortly.

C. DRIEBERG,

April 8, 1907. *Secretary, Ceylon Agricultural Society.*

NUWARA ELIYA AGRI-HORTICULTURAL SHOW.

April 2nd and 3rd, 1907.

Report on Class IX—Native Products.

Native fruits were on the whole poor, due chiefly to the fact, I take it, that they were not in season. *Vegetables* were much better—*Pumpkins* and *Brinjals* being particularly good. The five specimens of chillies and capsicums exhibited by Mr. Farr deserve special mention. *The Dry Grains* (Kurakkan, Indian corn, Ulundu, Kollu and Gingelly) were very well represented. *Coconuts* were not up to standard, but the bunches of *Arecanuts* were noticeable.

Nothing was shown under *Curry-stuff*, and this only proves how little attention is paid to the cultivation of these necessaries, so largely imported from India. The exhibits of *Gram* and other *Pulses* were particularly good. *Paddy* was not well represented, and the prize offered by the Ceylon Agricultural Society (Rs. 25) for the best collection was awarded with considerable diffidence. A similar prize for best collection of *Native Vegetables* was reduced to Rs. 10. The rest of the Exhibits in this class were considerably below standard, and a number of prizes had to be withheld. The largest and most successful exhibitor in the class was the R. M. of Walapana. A specially interesting exhibit, which must not be passed over, was that prepared by Mr. J. F. Jowitt, of 'Craig,' Bandarawela. This consisted (*a*) of a case of the seeds of edible Gramineæ, (*b*) microscopic slides of the same, and (*c*) panels containing mounted specimens of the grasses themselves. The materials for the exhibits were procured by me with the help of Mr. J. N. Sangrasagra (Manikar of Delft), and the teacher of Gallagama Government School. Mr. Jowitt's exhibits was offered to and accepted by the Curator of the R. B. G., on behalf of the Director for the Economic Museum at Peradeniya. Such an exhibit should prove very acceptable, I should think, to the Imperial Institute. Kurakkan (*Eleusine coracana*), Amu (*Paspalum scrobiculatum*), and Mineri (*Panicum miliaceum*) are in local repute as diabetic diets, and Mr. Jowitt has kindly consented to prepare a series of the different varieties of these grains for a Colombo medical man who expects to take part in the discussion on the subject of diabetic diets which is coming up at the next meeting of the British Medical Association.

C. DRIEBERG,

Secretary, Ceylon Agricultural Society.

Report on Live Stock.

The horses and poultry were well represented at the Show. Other live stock, including cattle, sheep and pigs, were not so well represented as last year. One reason for this was that Great Western Estate, which used to exhibit a good number of fine English and Australian cattle during previous years, did not exhibit any this time. There were only twenty-one head of these other live stock exhibited, of which ten were English and Australian cattle, one Indian, three native, two cross bred Indian cattle, four sheep and one sow.

The entrance fee for cattle owned by villagers has been reduced this year from Rs. 2-50 to one rupee, so as to induce them to exhibit their cattle and compete for prizes, but it is a matter for regret that this has not had the desired effect. One reason of this may be found in the fact that Nuwara Eliya is not a suitable centre for attracting native villagers, the distance and the climate being rather uninviting to them. However, if the Kandyan chiefs and headmen use their influence, they will be able to induce the villagers to take a lively interest in the exhibition of their cattle and agricultural products.

E. T. HOOLE,

Acting Govt. Veterinary Surgeon

Colombo, 6th April 1907.